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Agriculture.

PRODUCTIVITY OF PERENNIAL COTTON PLANTS.

BY DANIEL JONES.

Considerable interest has been taken in, and much discussion has followed, a recent statement anent the prolific character of cotton plants in this country. That the nature of the information should arouse some doubt—particularly to those conversant only with the habit of the plant in other cotton-growing countries—will cause little or no surprise. The claim that a cotton plant will, within a twelvemonth, furnish a yield of fibre in seed up to 20 lb. weight in that period is certainly something unusual to record. Nevertheless there is authentic evidence to prove this to be the case. I have gathered from a plant growing at the Rectory, Cairns, some fibre from a shrub planted by the Rev. Joseph Campbell, who certifies that in one year its yield was 20 lb. weight of fibre much superior to American cotton.

There is a statement, which I have not personally verified, that a variety of tree cotton (of which I had a sample) had in the one year also borne 20 lb. weight of fibre. This was obtained from the Logan district. The most recent and authentic record for a six months' harvest comes from the Bundaberg district, from Mr. William Howard, of Fairfield, Wongarra, who has sent to me a bag of cotton weighing 14 lb. which is the product of one shrub. The plant is now about eight years old, and until the present year had cropped luxuriantly; but no value was attached to the circumstance; hence the cotton was allowed to waste. Early in this year, Mr. Howard conceived the idea of investigating the merit of the fibre, and forwarded me an example, which I found to be a good sample of an Egyptian type of cotton, worth then, at Liverpool parity, at least from 9d. per lb. or more in seed. It is anticipated, when the next six months' picking is finished, that the return from this shrub will equal, if not surpass, the records indicated as obtained by the other growers.

On a recent quest for new types of cotton, I saw one shrub in the Bundaberg district that was trained over a trellis and used by the busy housewife as a laundry arbour, the spread of the plant being fully 20 ft. As in other instances, the valuable fibre was permitted to go to waste, no care of the plant or product being in evidence.

On making representations to the owner, suggesting the utilisation of the fibre, and showing that it was at least worth 6d. per lb. as gathered, the promise was readily given to harvest in future all the fibre procurable for seed and lint utilisation.

I have been considerably mortified, on more than one occasion, to find that shrubs of exceptional merit are destroyed by owners who aver that the fibre blowing about the yard created such a mess that they had to remove them. This all indicates with what ease and in how suitable a habitat the perennial varieties of the cotton plant find themselves in our sunny Queensland.

As evidence of this, I have recently obtained from the North an example of the Kidney variety of cotton which has grown untended for some years in a wild state to such an extent that recently the local authorities had to send the road gang to cut out the intruding cotton plants which obstructed the highway.

This fibre, as well as others described, would bring at least from 4s. to 6s. per lb. in lint in the Lancashire markets.

With regard to the productivity of the Upland variety of cotton, we are not able to show such high returns. Nevertheless we come very near to, if we do not surpass, the best American yields. A long-sampled Upland variety which I have been testing for about fourteen years, plants of which are now thriving at my home in Brisbane, has given excellent returns annually for the past thirteen years. One shrub has, owing largely to its location, borne much more fibre than the others. My record from this shrub in its twelfth year of bearing is 6 lb. weight of fibre. The others return from 2 lb. to 4 lb. each year, bearing—as do the tree-varieties—two crops in the year.

These plants being spaced—the Egyptian perennial at 12 ft. apart, and the long-stapled Upland at 6 ft.—will, in the first instance, furnish (basing the yield on an average of only 4 lb. weight per shrub with 302 plants to the acre) over £30 worth of cotton as the season's crop. In the other case, the long-stapled Upland, if spaced at 6 ft. apart (there being 1,210 plants per acre), valuing both sorts at 6d. per lb. in seed, it will be evident that, at these much reduced calculations, the value in each case will be over £30 worth of cotton per acre. We frequently hear of large yields, particularly from the irrigated areas in Arizona and the Imperial Valley in the United States of America. It is often claimed that a bale of lint (500 lb., and at times as much as 750 lb. of lint) is obtained to the acre in those favoured regions.

It is also asserted that with an adequate supply of water for irrigation purposes we, in Queensland, could materially increase the production of farm crops. It may be a matter of some surprise to many to learn that in this State there has been produced as much cotton to the acre, without any irrigation, as the Americans claim to have done with this supposed advantage. The fact remains that we have climatic and seasonal conditions in this country which amply compensate for the absence of water for irrigation purposes. By growing the drought-resisting perennial variety we can hold our own with any other competing country.

We have records of crops of Upland cotton reaching up to 2,300 lb. of seed cotton per acre. This, allowing 3 lb. of seed cotton to 1 lb. of lint, would mean a bale of lint weighing 766 lb. to the acre.

I recently learned, on a visit to the Ma Ma Creek district, that Mr. R. J. Dear sent to the Department of Agriculture, in 1918, 2,880 lb. of cotton from 2 acres, the value of which, at the then lower price, was over £27 per acre. This return shows it to be 480 lb. of lint to the acre obtained during a rather bad season. We thus learn that in the raising of this crop we have no need to dread oversea competitors, inasmuch as our seasonal and climatic conditions favour this vocation, enabling us to produce as cheaply as is assumed to be the case in countries where coloured labour is employed. In these calculations I have intentionally placed the estimates of profit and yield per acre on a low basis, so that if any prospective growers find them much under-estimated when testing the crop for themselves, they will be agreeably disappointed, as many growers know to be the case this season, which is so much the better for all concerned.

The fecundity of the cotton plant is demonstrated in a ginning test made recently in connection with the material obtained from the shrub grown by Mr. Howard, and referred to in this article. On ginning with a Macarthy roller gin, the 14 lb. of seed cotton returned as lint 5¼ lb., with three-quarters of a pound of seed. As this is a free-seeding variety, the linting process indispensable with the Upland type is not required. For this reason it can be utilised for oil-making purposes without further treatment.

The comparison of lint to seed showed a very satisfactory result—viz., 37½ per cent. lint, and, taking the Liverpool value of fibre of this class at the low rate of 4s. per lb., it appears that the 5½ lb. yield is worth over 20s. What it may be possible to raise of this type on a large plantation system cannot as yet be definitely shown; nevertheless, the actual experience of what this and other shrubs have furnished would lead to the conclusion that a substantial profit is assured any who

elect to raise this sort of cotton. Another interesting factor in this connection relates to the fecundity of the plant in its seeding proclivities. Actual count showed that 213 seed weighed 1 oz. As the total weight of seed furnished was 8¾ lb., it follows that there are 3,392 seeds in a pound. This, multiplied by 16, gives as a gross total 29,332 seeds from this one plant in its six months' crop. This, assuming one in every three seed to be fertile enough to germinate, would prove sufficient to sow about 30 acres of this variety of cotton, spacing the plants 12 ft. by 12 ft.

This mass of seed from one plant conveys the idea that we in Queensland have a great advantage over countries that are, by force of circumstances, compelled to raise cotton as an annual, and rests on the fact that annual sowing is not expedient for many reasons, chief of which relates to the extra yield furnished in following the perennial system. A significant factor is also in evidence showing in what way well-informed authorities on cotton-growing can drift into error.

In an article in last month's Journal, taken from American sources, it is emphatically maintained that perennial cotton should not be cultivated, giving sundry reasons against the system.

In Queensland, for the past forty years growers have persisted in raising cotton, relying on its perennial merit; and much more than mere opinion will be needed to induce our growers to depart from this method. We invariably find that the second yield from ratoon Uplands gives a heavier crop than is obtained from the plant shrubs.

In the case of the large growing perennials, the maturity period from which the best yields are obtained ranges from the fourth year onward. The system coming into vogue in localities where the perennial Egyptian type flourishes best—viz., our coastal areas north of Brisbane—is to sow the Upland variety and the Egyptian in the same field, sowing the Egyptian in spaces 12 ft. apart, filling up the intervening spaces and rows with the earlier maturing Upland variety.

The reason for this new departure is in order to gain the advantage of an early crop which is furnished in five months from the Upland. The Egyptian sort is longer in bearing; hence the reason, as the new settler has a swift return, instead of waiting for a year or eighteen months for the Egyptian to come into profit.

When this plan is adopted, in from two to three years the Upland cotton will have outlived its utility, and can be cut out, leaving the field for the Egyptian plants. Observation shows that there is much to be learned and demonstrated in the tillage of the Egyptian plant.

I have, on many occasions, noted that, when these shrubs were submitted to the methods of tillage usually advised for the Upland variety, in most instances they have not thriven as might be expected. In almost every instance where I have observed a robust-growing Egyptian plant, it has always been one that has had little or no attention. Judging from this fact, it will be well to experiment in this direction, relying on such help as mulching, pruning, and a few other attentions which the grower will note as practical to carry out. Personally, I am of the opinion that in the future treatment of this type of cotton the method of cultivation will more nearly resemble that of an orchard than of a plantation system. Whether this be so or not will soon be proven, as several prospective growers in the Bundaberg district, noting the habit of the plant, aver their confidence in this system of raising cotton.

Contrary to experience elsewhere, perennial cotton here is not as subject to predatory insect troubles as is the Upland variety. In the United States and the West Indies, the objection to treating cotton as a perennial relates to the difficulty of dealing with these pests, coupled with the belief that perennial-grown cotton is defective in quality of staple.

We have on many occasions sent examples of perennial fibre to valuators in Lancashire and London, and the perennial-grown fibre has on every occasion been appraised as equal in value to the annual-grown article and, on most occasions, quoted as being worth more per lb. From this it will be seen that in this new country we must not follow the lead of folk who, lacking experience of our local conditions, elect to advise on these matters. It may be well left to the intelligence of the Queensland farmer to determine sooner or later for himself what method to pursue. We are rapidly gleaning facts by observation and experiment which indicate that in this crop we have sources of wealth undreamed of which will lead to solid advancement.

Recent cables from London report that some Queensland fibre valued for the Agent-General (Mr. J. M. Hunter) was appraised at 5s. per lb. This was also a variety of perennial-grown cotton. Other cotton of a perennial character was valued at from 4s. 2d. upward. This surely proves that the contention of the British

Cotton-growing Association, who have persistently objected to our growing perennial cotton, shows them to have misjudged the whole question. Some of these fibres were not longer than $1\frac{3}{16}$ in. to $1\frac{5}{16}$ in., the value of which was from 4s. 2d. to 4s. 8d. per lb. in lint.

We raise on perennial shrubs, fibre ranging from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. long, which, if placed on the same market, would rival in value and quality that recently valued by the Lancashire brokers. During the past few months, Egyptian cotton has reached up to 8s. and 10s. per lb. A drop has recently occurred, but present values range from 4s. to 7s. 6d. per lb., which indicates that we, in this country, may look forward to a good demand for all the high-class cotton we have ability to produce.

SHORT- AND LONG-STAPLED COTTON.

A West Indian cotton planter, Mr. A. N. S. Cheales, lately visited Natal, and the "Natal Advertiser," recording his visit, the object of which was to develop the industry, said: "This gentleman seems to think that we in this country are very slow to realise the great shortage of cotton, and are not making the most of the favourable opportunity and high prices.

"It is a singular fact that planters on the North Coast who put in a few acres of cotton some years ago still grow only a few acres each year, although they have secured consistently £30 to £40 per acre per annum from their cotton and, admittedly, a bigger profit per acre than from their cane. Why, then, do these planters not plant more cotton? Why do their neighbours not take up cotton-growing?

"Again, in the Tugela Valley two companies have been making excellent profits out of cotton for some years, and around them are thousands of acres of land lying idle, while returned soldiers shout to the Government for farms. Why have adjoining farms to these not been put under cotton?

"We think, like our visitor, that the country needs more growers who understand the cotton plant, and more to take it up, with the determination that cotton will be made a success and to 'stick to cotton.' The Government cotton expert is always willing to give the advice necessary for one to soon acquire the requisite knowledge.

"Most likely the absence of a market has been the biggest hindrance to progress, and since the Cotton Growers' Association has provided marketing and ginning facilities that would be a lesson even to the West Indies, the expansion of cotton-growing may be expected to be more rapid.

"If Mr. Cheales comes to Natal and undertakes cotton-growing we are sure he will receive a hearty welcome. The South African cotton industry would greatly benefit by the introduction of new capital from outside.

"Especially would we like to see Mr. Cheales in the cotton industry here as he believes in the suitability of the climate and soil for Sea Island cotton. Undoubtedly the demand to-day is for a long-stapled Upland, Sea Island, or Egyptian type, and we are of the opinion that the best type to be grown here is the long-staped Upland cotton of one and one-eighth to one and one-fourth inches. We do not wish to discourage Mr. Cheales in his desire to grow Sea Island. If it will grow anywhere in South Africa, that place is the Natal Coast. We wish him success and trust he will undertake the work and, if successful, then no doubt many will import West Indian managers, as he suggests. But it is as well to remember that Sea Island has failed where the American Upland has succeeded."

The above applies equally to the cotton-growing industry in Queensland, particularly in that we, in this State, with lands so eminently adapted to cotton-growing, from the New South Wales border to Thursday Island, and westward to the boundary of South Australia and the Northern Territory, are not only slow to realise the great, not possibilities, but certainties of the industry, but actually ignore the results of cotton-growing in this State during the American civil war.

We, ourselves, were in those days engaged in the industry. We established a ginnery at Oxley Creek west (Sherwood). We paid the farmers 3d. per lb. for their seed cotton, at which price they made more than by the raising of maize, potatoes, &c. To-day they are guaranteed by the Government a price of $5\frac{1}{2}$d. per lb. for their seed cotton, with a participation, in addition, in all profits made by the sale of the lint. Everything points to a heavy shortage in cotton supplies in the future. Prices are

more likely to soar than to decline. Whilst other countries where cotton is largely grown, as in the United States, Egypt, &c., are troubled with serious pests which, in the former greatest cotton-growing country of the world, have been the cause of the devastation of large areas of the cotton States. Queensland growers are exempt from any but minor trouble in this respect. Yet we cannot impress upon them that a cotton crop will be more profitable to them than many other crops. For example, take the results of potato-growing in the Far North; some of the best varieties produce only from 2 to 3 tons per acre. We leave it to the farmers to work out which crop would pay them better—cotton or potatoes—account being taken in either case of cost of seed, cost of cultivation, harvesting, freight, &c.

Whilst Queensland is delaying, other countries are striving to extend the cultivation of cotton. The Government, in this State, has done all that is possible to encourage cotton-growing and to make the industry profitable both to the grower and the State. Why is this assistance not more generally recognised?

PLANT COTTON *v.* RATOONS.

Some growers advocate the ratooning of the cotton plant after the harvest, the idea being to obtain an early crop in the following season. There is, however, another side of the question. If the cotton has been planted at a distance of 4 ft. each way there will be 2,722 plants per acre, and, with farm labour at the present abnormal wages, the cost of pruning down this number of plants would make the succeeding crop unprofitable, besides which the ratooned crop will not be as prolifiic as a newly-planted crop. This has been clearly demonstrated in Zululand, where the ratooned crop, while giving a fair picking, bore not half as much as the December planting of the Bancroft variety. In selecting seed for planting purposes, the longest and best-stapled cottons should be chosen, and, by so doing, season after season, a cotton equal in strength, length, and lustre to the best grown in the valley of the Mississippi will result.

THE LONDON "TIMES" AND THE COTTON INDUSTRY.

The London "Times" Trade Supplement (October, 1919) is, throughout, a most exhaustive and interesting history of the cotton industry of the world from the field to the spinning mill. Commencing with the methods of cotton cultivation adopted in the world's cotton-growing countries, in respect of implements, hand labour, irrigation, the various pests and measures for combating them are described. The United States cotton crop, and the proceedings of the New Orleans Conference are discussed by Sir Charles W. Mucara, Bart., a celebrated authority on the cotton industry. Ginning, baling, buying, and selling cotton; the value of cotton seed; how cotton is spun; the construction, equipment, and working of modern spinning mills, and, in fact, everything relating to the world's cotton industry, is set forth clearly in this "Times" supplement. We could occupy all the available space in this Journal with only a résumé of what is therein set forth. We can, however, only touch on its salient points. What is not given a place to as a cotton-producing country is this vast island continent of Australia. The only mention of it refers to its position amongst the markets of the world for British cotton goods. The quantities of raw cotton purchased in different countries include India, 60,000,000 lb.; other Empire countries, 14,000,000 lb. Under the head of cotton goods sold to the outside world, we find 1,666,000 yards were sold to Australia—to a country eminently adapted to cotton growing, free from any such diseases of the plant and boll as affect the United States and other lands; yet capable of overtaking those States in cotton production if its population were increased by the immigration of thousands of our own countrymen from Great Britain.

The Queensland Department of Agriculture has taken the utmost care to prevent the introduction of the boll weevil and the pink boll worm, and consequently these do not exist anywhere in Australia.

What has the "Times" to tell us of the ravages of these pests?

THE BOLL WEEVIL.

"Many years ago it was stated by a leading authority in the United States that, from the time of planting to the time of maturity, cotton was the constant object of attack. The chief insect which causes serious injury to the plants is the boll weevil. The little pest appeared in Mexico as far back as 1862, but it was not till about 1892 that the insect was discovered in the Southern States of America.

It is estimated that about two-thirds of the cotton belt in the United States is now affected more or less by the exertions of the boll weevil, and it is not too much to say that, but for this untoward development, the amount of cotton grown would, by this time, have been increased nearly 100 per cent.'' That is to say, that the total production of the United States cotton would now amount to 27,000,000 lb. instead of as this year to only 13,500,000 lb.

THE PINK BOLL WORM.

The other most serious enemy of the cotton plant is the pink boll worm, which is understood to be a native of Egypt, where, for many years, it has done great damage to the cotton crops. It was not until about 1911 that this pest was noted in Mexico, and it is stated that unquestionably this insect was introduced to the Western World through importations of Egyptian cotton seed. In two or three years its ravages had caused great apprehension. It was estimated that, in 1917, about 3,000 acres of cotton land in Texas (U.S.A.) were affected by the pink boll worm.

The ''Times'' article further states that, ''as in the case of many other crops, an important factor is an abundant supply of cheap labour. This might hardly be thought of vital importance from a consideration of the simple nature of the cultivation of the cotton plant, which includes, as for any other crop, thorough preparation of the soil; the use of a comparatively small quantity of manure; thick sowing of the seed, which is inexpensive*; thinning out the seedlings to appropriate distances in the rows; careful interculture during the growing period, to free the land of weeds and prevent undue evaporation of soil moisture, this interculture ceasing as soon as the bolls begin to form; and, lastly, picking the cotton out of the bolls when they open—this does not seem a formidable programme of work,'' and is incidental to all farm crops. Dr. A. E. Barber, C.I.E., the author of the ''Times'' article on ''Methods of Cultivation,'' says: ''Without doubt, a machine could be constructed to sow the seeds at the required distance, and some day, perhaps, the persistent attempts at the invention of a mechanical picker may be crowned with success, leaving nothing for the hand labourer to do.''

As far as the sowing of the seeds by machinery is concerned, we venture to say that that difficulty has been overcome, as stated in the ''Queensland Agricultural Journal'' (October, 1919) by the manager of the State Farm, Roma (Queensland), who forwarded to the Department a sample of cotton seed specially prepared to admit of sowing by a seed drill. In commenting on the matter, the Director of Agriculture, Mr. Quodling, states that the fluffy fibre adhering to Upland cotton seed after ginning and ''linting'' causes the seeds to bunch together, which means that the sowing must be done by hand, which is a tedious process. This difficulty has been now overcome by treating the seed with fine puddled clay, which envelops the loose fibre, and leaves the seed in a smooth rounded form, in which condition, after drying, it will readily pass through the drill—a process calculated to reduce the cost of planting operations. In the accompanying illustration No. 1 shows the seed as it leaves the gin, and No. 2 shows it as prepared for the drill. A mechanical pneumatic cotton picker was invented by Mr. Daniel Jones, cotton expert of the Department of Agriculture (Queensland), which has been improved upon in California, U.S.A., from accounts received in April, 1919, and was fully described and illustrated in this Journal in April 1919. The work done by it without injury to unopened bolls amounted to 5,000 lb. per day of ten hours. The machine is said to be a complete success in America, but it has not yet made its appearance in Queensland.

COTTON PROOF AGAINST DAMAGE BY DROUGHT OR RAIN.

It has frequently been stated that under certain climatic conditions, the cotton, just after emerging from the boll, will suffer from discolouration and weakness of the fibre. That this is not often the case can be shown by the boll here illustrated. The plant from which it was taken was raised from seed (Duranga), sown in September, 1919. It lay long in the ground before germinating, and only fruited in May, 1920. The boll burst in May and the cotton was exposed to heavy showers of rain, and, later on, to cold winds and frost. Notwithstanding this, it retained its lustre and perfect colour when picked late in June last, not having the slightest sign of discolouration, nor was the length or strength of the fibre in the least impaired, the length of staple being 1⅛ in. Illustration by Arthur Nicholson, Department of Agriculture and Stock.

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* Seed is liberally supplied to growers in Queensland, at no cost to them, by the Department of Agriculture.—ED.

COTTON PLANTING.

The "South African Sugar Journal" states that the cotton industry is steadily spreading in Zululand, and some nice crops are observable from the railway line. As has been pointed out before, the low price of sugar is forcing South African planters to seriously consider whether they should not go in for this industry in preference to sugar-cane growing. In many instances, land which would have gone under cane is now going under cotton.

The same journal deals with the necessity for

CROP ROTATIONS.

It is not advisable to grow any crops on the same land year after year—an axiom accepted by agriculturists the world over. This being the case, cotton growers are considering what other crops they can put in. Those in the sugar belt, no doubt, after two years with cotton, will find it necessary to revert to cane. Those, however, who have a suitable soil would find it to their advantage to plant, for one season, monkey-nuts (peanuts). Monkey-nuts are a leguminous crop and, apart from being a change for the soil, supply nitrogen.

Apart from being an advantage to the soil, the crop is a very profitable one, good, sound monkey-nuts being worth approximately 3d. per lb. in the shell.* For certain areas, in addition to monkey-nuts, mealies (maize), or kaffir corn provide another crop in the rotation.

Mr. W. H. Scherffius, Chief of the Tobacco and Cotton Division, used on the experimental plots at Rustenburg Experiment Station the following rotation:—

First year	..	Cotton.
Second year	..	A legume (either monkey-nuts, velvet beans, cow peas or soya beans).
Third year	..	Mealies during the summer, and a winter-cereal, such as oats or wheat, during the winter if the land were irrigable.
Fourth year	..	Tobacco.
Fifth year	..	Cotton again, and so on in the rotation as named.

Some growers on the coast may find it advantageous to rotate cotton with bananas, pineapples and such crops as these, which are rather commonly grown on the coast but not up country.

ROTATION AND DISEASES.

A field of cotton recently inspected, on which the cotton stood well and was healthy throughout, was a field that four years ago suffered through the cotton dying out in patches. This fault was attributed at the time to the fungus disease known as "cotton wilt." The land is in the meantime being cultivated to mealies, rape, and root crops.

It may not be that the freedom from disease this season is due to the crop rotation, but the effects are worth noting, and if similar results can be secured continually the practice is worth following.

TO COTTON GROWERS: COTTON SEED.

The Department of Agriculture and Stock will be pleased to supply growers with cotton seed free of cost and railage paid.

Further, the Department will advance 5½d. per lb. on all seed cotton free from disease and of good quality grown prior to the 30th June, 1922, consigned to the Department and delivered at the railway station or port nearest to the place where it was grown.

The raw cotton will be subsequently ginned and sold, on owner's account, and after paying the expenses, the surplus over and above the original 5½d. per lb. will be paid to the supplier of the raw cotton.

In the Department's cotton pamphlet it will be noted that the amount required to plant an acre is given as 5 lbs., but the Department allows 10 lbs. of seed to the acre for each applicant to provide for replants or any other contingencies.

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* 6d. to 7d. in Queensland.

IRRIGATION OF THE WOONGARRA SUGAR DISTRICT, BUNDABERG.

In the course of the highly successful demonstration on the annual field day, on 5th June last, when farmers from near and far gathered, at the invitation of the Department of Agriculture, to learn something concerning the experiments continuously carried on at the Sugar Experiment Station, the subject of irrigation of the Woongarra district was brought up by Messrs. Cattermull and A. C. Maughan. For some years this subject has been in abeyance. It may interest the sugar-growers of the district if we reproduce some notes recorded by the Editor of this journal when on an official visit to various districts of the State, coastwise and as far inland as Longreach and Thargomindah, to obtain all available data on the application of irrigation to cultivated lands. Amongst the localities visited was the Woongarra Scrub, and the following was what we gathered from Mr. J. White, M.L.A., erstwhile Minister for Agriculture, Dr. Walter Maxwell, then (1902) Director of Sugar Experiment Stations in Queensland, and local farmers. Space will not allow of a full account of the labours of well-sinking to obtain the necessary water for the irrigation of the cane crops of this fertile tract of country; but we can give an abridged account of what was proposed and how the waters of the Elliot River could be utilised for purposes of planting, saving, and increasing the crops. To form some idea of what was proposed to be done for the district, the reader must suppose a level area of some 6,000 acres extending from within 4 miles of Bundaberg to the ocean, some 6 miles further. The only high hill in the district is called "The Hummock," a basaltic hill about 220 ft. in height, which gives its name to the historic plantation on which it is situated. There is a river in the district, named the Elliot, which takes its rise in the country between Bundaberg and Maryborough, and flows into the ocean near the Springfield town reserve.

On Mr. White's invitation, we drove out to inspect it. The portion of the country where we struck the river is sandy, scrubby, and intersected by gullies and billabongs, mostly full of clear, fresh, running water. The river itself resembles in some respects the upper reaches of the Barron River above the falls at Kuranda, only here sand takes the place of rock which forms the bed of the Barron. There are long, deep reaches, 200 ft. wide, the depth of which varies from 17 to 38 ft., according to accurate soundings which were taken during a period extending over six weeks.

Some of the reaches are as wide as stated, while others are from 1 to 2 chains in width. Then comes a "narrow" where the clear, cool water rushes past with great velocity, and where the white, sandy bottom can be plainly seen at a depth of from 6 to 8 ft. Below each "narrow" is another extensive reach. The water flowing in this reach is permanent, and some evidence of this is afforded by the quantity and large size of the fish which inhabit it. It has been stated that 7,000,000 gallons of water pass down the stream every twenty-four hours. I am not aware how this flow was estimated, but I presume that it was based on the principle of measuring the flow by the shallowest spots. Where a river is divided into deep reaches by shallow narrows, the flow of water passing down the stream is gauged by the flow along these narrows. A reach may be 30 ft. deep, but if the outlet be only 4 ft. deep, then only 4 ft. of water are in motion, and the remaining 26 ft. are stationary. But this was doubtless taken into consideration in determining the daily flow of the Elliot River. I merely point this out, as it might be asked, how 12,000,000 gallons daily (which is the quantity estimated, as needed to irrigate 3,000 acres) can be supplied from a river down which only 7,000,000 gallons a day pass. The stationary water must come into the bill by the use of pumps. The highest point of the land to be irrigated lies at an elevation of 117 ft. above the surface of the water—this, during a drought. I was informed by an authority on irrigation that when rain fell in March, and the Burnett River ran strongly, there was no response in the former river.

The scheme favoured in 1902 by the residents on the Woongarra land, or, say, by a majority of them (for some objected to a probable water rate) was to carry the waters of the Elliott by pipes 32 in. in diameter for a distance of 6 miles to a reservoir on the top of the Hummock, a height of 218 ft. Thence it was proposed to

irrigate, by gravitation, an area of 3,000 acres only, although there are 6,000 acres within the irrigable area. The pumping plant which would be installed would send 12,000,000 gallons daily over 3,000 acres. The financial aspect of the scheme in those days indicated that a sum of £70,000 would be required to carry it out. Supposing the £70,000 to have been obtained either by loan or by the issue of debentures, then interest and redemption would have to be provided for. This, it was believed, could have been done by the imposition of an irrigation water rate of £3 per acre.

The question agitating the mind of the Woongarra settlers was: "Would the increased crops enable them to pay this rate and yet make a good profit for the farmer?" The results would be expected to work out in this way:—On the debtor side the farmer would have to spend on cultivating and manuring per acre £17, and for water rate £3, total £20. On the credit side:—60 tons of cane per acre, at 12s. per ton, £36; deduct £20. This leaves net balance to credit per acre, £16.

If we compare the cost per acre by this scheme with that by the well system, it will be seen that there is very little difference between them as, by the latter, a farmer possessed of the necessary capital could lay down a plant sufficient to irrigate 200 acres for £760 (as at the date under review) at Waterview, or to irrigate 250 acres, as at the mill well at Qunaba, for £2,057; or, again, to irrigate 300 acres for £832, as at Davidson's Well—the cost depending on the nature of the country through which the well is sunk, the height to which the water has to be lifted, the cost of fuel, the lay of the land, and the distance of the pump from the highest point of land to be irrigated. In our next issue of the journal we will recall what the Woongarra cane-growers did in former years in the search for the precious water so indispensable to their welfare, and, indeed, to their very existence on the land.

(TO BE CONTINUED.)

IRISH BLIGHT.

By A. H. BENSON, Director of Fruit Culture.

The attention of potato and tomato growers is drawn to the necessity of their taking every possible precaution to prevent the destruction of their crops during the coming season from "Irish Blight," as this disease has recently made its appearance in several coastal districts. The outbreak is due to the exceptionally favourable weather conditions that have prevailed, such conditions being ideal for the development of the fungus causing the disease.

The following extract, which I have taken from the last edition of my pamphlet on the "Destruction of Fruit and Vegetable Pests," should be carefully studied, as, if the precautionary measures advocated therein are thoroughly carried out, there should be little loss from this pest, should the weather conditions during the coming spring prove favourable for its development.

With respect to tomatoes the same treatment recommended in the case of potatoes is efficacious, viz., the systematic spraying of the young plants from the time they are a few inches high right up to the fruiting stage, whenever the weather conditions are favourable for the development of the disease.

"This extremely destructive fungus is fortunately capable of being kept in control by the exercise of simple precautions, provided these precautions are taken at the right time and are properly carried out.

"Like most fungus diseases Irish blight is much easier to prevent than to cure, as once it makes its appearance it is so rapid in its action, provided the weather conditions are favourable for its development, that it is possible for the entire crop to be destroyed before any effective action can be taken to check it. Fortunately such weather conditions are by no means common in this State, and on that account, although we are always subject to sporadic outbreaks, it is very unlikely that the whole crop of a district will be destroyed. At the same time, the disease is of such a serious nature that we cannot afford to neglect any precautions to keep it in

speed. Irish blight is not confined to potatoes, but it attacks tomatoes as well as many other introduced and indigenous plants belonging to the same family, so that it is by no means an easy pest to exterminate, as there are host plants available for its development and propagation throughout the year; and were it not for our experiencing hot, dry spells, when the spores of the fungus are destroyed (as they cannot withstand our sun heat), we would experience much greater losses than we do. Although this disease has been described by many very able writers, there are still growers who are unable to identify it in its first stages, and to such the following remarks will be found useful:—

"The first indication of the disease is seen on the foliage, the edges of the leaves being turned black. If these leaves are examined in the early morning the blackened portion will be found to be covered with a fine glistening white mould on the under side of the leaf, which usually disappears during the heat of the day. The next stage is the blackening of the whole of the tops and their death, and in bad cases the rotting of the tubers as well.

"Black spots all over the leaves are not Irish blight, but usually indicate early blight or the Macrosporium of the potato; but the white mould on the under side of the leaves is a certain indication.

"The disease makes its appearance on the tubers in the form of slightly sunken patches on the skin, by the discolouration of the skin, and by the discolouration of the flesh of the tuber just under the skin. These are the first indications, and they soon become much more pronounced till, finally, the whole tuber is a rotten mass and possesses a strong putrefactive odour, the result of decomposition due to bacterial agencies. This is the so-called smell of Irish blight; but when the smell is present the disease has done its work, and putrefactive agencies are completing the damage it started.

"As the treatment for Irish blight is mainly preventive it is necessary to deal with it pretty fully. It is of a threefold nature—the treatment of the seed, that of the growing crop, and that of the tubers when harvested. With respect to the seed, the following precautions are recommended:—

First.—Cut all seed.

Second.—Discard any seed that shows any signs of diseased or abnormal conditions, such as any discolouration of the flesh or skin, sweating at the eyes, or scabbiness of the skin.

Third.—Dip all seed in a solution of formalin for at least two hours. The solution is made by adding 1 pint of formalin (40 per cent.) to 24 gallons of water. This will destroy any spores adhering to the surface of the potato.

"If round seed is planted without being cut it should be very carefully examined for any sign of the disease on the skin, and all doubtful tubers should be excluded; the balance dipped as recommended. Dipping cut seed prevents its rotting in the ground when it is planted—a condition which frequently occurs when untreated cut seed is planted during the late summer and early autumn.

"The growing crop is treated by spraying with Bordeaux or Burgundy mixture, the latter being, in my opinion, preferable to the former for this particular disease. Burgundy mixture is made as follows:—

"Dissolve 8 lb. of sulphate of copper (bluestone) in a cask holding 35 gallons of water. Next dissolve 10 lb. of washing soda in 5 gallons of water in another vessel; finally pour the solution of washing soda slowly into the bluestone solution, stirring the mixture continuously whilst doing so; and it is then ready for use.

"Burgundy mixture should always be used as soon as it is made, as it quickly deteriorates and loses its adhesive properties.

"Where blight is prevalent, several sprayings are necessary during the growing period, the first of which should always be given when the plants are about 6 to 8 in. high; and the subsequent sprayings should be given when required. No hard and fast lines can be laid down for the exact time of the second or later sprayings, as the time is mainly governed by weather conditions. If these are favourable for the

development of the disease—viz., moist, foggy, or humid weather—then the spraying must be repeated at frequent intervals, as the young leaves as they develop must be protected by being coated with the spraying material. On the other hand, if dry, warm weather follows, a second spraying when the plants have made their full growth is all that is necessary to prevent the disease doing any serious damage, and in the majority of cases in this climate it will render the crop practically immune. In addition to spraying, the keeping of the land in a good state of tilth so that the plants can be well hilled up is very desirable, as, should disease appear on the tops, if the tubers are well protected by a good soil mulch there is a possibility of the spores produced on the foliage being unable to reach the tubers, especially if warm, dry weather conditions follow the moist conditions which were present when the tops were attacked. If the tops are attacked when the tubers are well developed, it is a good plan to cut off and burn all the tops, as by doing so the tubers will be frequently saved.

"The handling of the tubers when digging and after they are dug is also a matter in which great care should be exercised. Digging should, if possible, be done when the soil is dry enough not to stick to the tubers, as, if the tubers are covered with soil, it is very difficult to pick out any diseased ones; this is very important, as should diseased tubers be placed in the same bag with sound tubers they are likely to infect such sound tubers, especially if they are wet. Careful handling at the time of digging is therefore important, as every tuber showing the slightest trace of the disease should be picked out, boiled, and fed to pigs or other farm animals. When the tubers are placed in the bag, see that they do not become sunburnt, a common occurrence with immature tubers; but on no account place a quantity of diseased tops on the bags to keep off the sun, as there is no better way of infecting the tubers in the bag; cover with an empty bag, if necessary, but never with potato tops. When bagged, see that the tubers are kept dry; don't store them when wet, as this will encourage the development of any spores that may be attached to the tubers.

"The treatment recommended for Irish blight is equally efficacious in the case of early blight—a disease which attacks both potatoes and tomatoes, and frequently materially injures the yield. When leaf-eating insects of any kind are present, arsenate of lead should be added to the Bordeaux or Burgundy mixture, thus forming a combined spray that possesses both fungicidal and insecticidal properties."

A RAPID EARTH THRUST-BORER.

During the long period of trench warfare, many devices were proposed for enabling bores to be made through the earth towards the enemy trenches so as to reach their mines. One invention by two British officers underwent successful trials, but it was never put to full use because it proved rather complex and cumbrous. This attempt, however, inspired one of the officers to design a much simpler appliance for rapidly and accurately boring a hole through clay and other heavy soil for drainage purposes, and laying electric cables or pipes. It is a portable hydraulic appliance, power being supplied by a small petrol engine, and it operates by the simple process of pushing a steel rod, fitted with a header of the diameter required, straight into the soil in the direction required. The rod is about 4 ft. long, and when it is pushed home, another rod is coupled to it and the forcing process is repeated. This goes on until anything from 100 to 150 ft. of rod have been forced through. As the diameter of the rod is much less than that of the hole, withdrawal is easy. Holes up to 15 in. in diameter can be made on this system, and experience has shown that with two men working ahead on the pit necessary to accommodate the machine, a boring team of three men can complete two 150-ft. borings in an eight-hour working day. Clay, consolidated loam, and sandy soil with a good percentage of clay can be satisfactorily bored by the machine. There is remarkably little deviation from the straight line in which the appliance is originally set.—"Industrial Publicity Service."

Pastoral.

SHEEP-PENNING DEVICE.

A correspondent of the "South African Farmers' Advocate" has furnished sketches and explanations of a device used when sheep were spout washed, and which might be used to simplify the work of penning up and compelling the sheep, without forcing or knocking about, to face the water when dipping for ticks, &c., or "jetting" for blowflies. The contrivance is a circular platform shown in plan, fig. 1, about

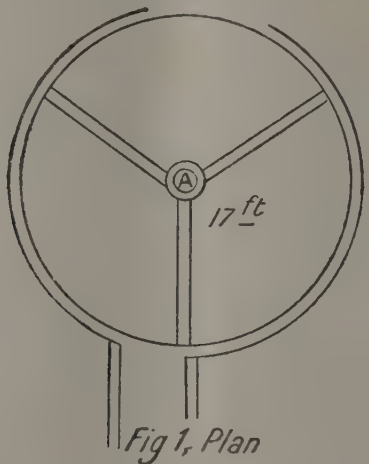


Fig 1, Plan

17 ft. in diameter, working on a central post or spindle, A, fig. 2, and supported by stout castor wheels, B, at the edge of the platform. The platform is divided into three pens. The pen in front, being full of sheep, acts as a draw for those behind. When the one pen is emptied, the platform is revolved, and a pull pen is at once

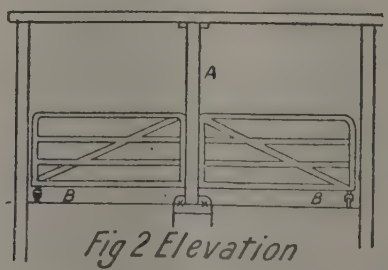


Fig 2 Elevation

available and the empty pen is easily filled. The circumference of the platform is boarded in, except at the opening where the sheep are thrown in and at the penning race. An improvement may be secured by dividing the platform into four compartments instead of three, thus throwing in the sheep at a right angle instead of in front. The sheep would probably pen up better.

Dairying.

DISTINCTION BETWEEN THE MILKING SHORTHORN AND THE ILLAWARRA SHORTHORN.

In connection with an inquiry made by a correspondent as to the distinction between the Milking Shorthorn and the Illawarra Shorthorn, Mr. E. Graham, Chief Dairy Expert, submits the following:—

"The Milking Shorthorn is a breed of dairy cattle evolved by stud masters in Great Britain. The names of the brothers Charles and Robert Colling stand out prominently amongst stud masters who were successful in establishing and maintaining a high standard of dual purpose cow, and these breeders utilise the Shorthorn strains as the medium.

"Records available indicate that the cattle of the Teesdale district during the middle of the eighteenth century carried a good deal of Shorthorn blood in their veins, and the dairy herds of that district were then recognised as first-class dairy animals, capable of yielding daily, several gallons of milk per cow. The famous stud masters, Colling Brothers, disposed of their respective Shorthorn herds within the years 1810 to 1818, and other breeders were thus afforded an opportunity to obtain Shorthorn animals that had been bred on sound dual purpose lines—that is, for milk and beef combined.

"About this period, however, it appears that the tendency of stud masters was to breed Shorthorns almost exclusively for beef purposes, and to pay little or no regard to the milk-producing capabilities of the animals.

"The first Shorthorn Herd Book in Great Britain was issued in 1822. Naturally, as beef was the objective of breeders, the beef characteristics gradually overshadowed the milking qualities of the Shorthorn, but, of course, any change in type would necessarily be gradual, and for years after the inclination to breed solely for beef had set in, there was still a number of cattle of the Shorthorn type that possessed good milking qualities, but, of course, the number was being reduced proportionate with the success achieved in the breeding on beef lines. This condition of affairs continued until the outcry, both in Great Britain and abroad, for Shorthorns with some dairy characteristics practically compelled the Shorthorn Society of Great Britain to renew the position, and to make some attempt to develop the milking trait of the modern Shorthorn. The Shorthorn Society responded by donating a substantial sum in prizes for pure Shorthorn cows in milk that were capable of fulfilling prescribed conditions as to milking capacity and udder development. No doubt, this action of the Shorthorn Society was instrumental in prompting many stud masters to make a serious effort to reconstitute the milking characteristics of the breed in many herds.

"The above summary of the history of the Shorthorn in Great Britain is rendered necessary in order to supply an answer to the query asked, because it is principally from Shorthorn stock imported from Great Britain that the Milking Shorthorn herds in Australia have originated. It must, however, be remembered that the Australian type of Shorthorn is different to the English type of Dairy Shorthorn.

"In regard to the Illawarra breed of dairy stock, the evidence is that the Illawarra breed of dairy stock was founded chiefly on the Shorthorn strains of cattle imported from Great Britain, combined with an admixture of Ayrshire and Devon blood. In the early history of dairying in Australia, the Illawarra District, in New South Wales, was the foremost dairying centre in this continent, and the name of the district became applied, in a general way, to the cattle employed by the dairymen of that particular district.

"As time went on, a number of breeders of this particular strain of dairy stock combined, and formed an Association entitled the 'Illawarra Dairy Cattle Association.' This action laid claim for the recognition of the Illawarra Shorthorn as a distinct breed of dairy cattle.

"Amongst the rules of the Association relating to the registration of animals in the Herd Book, considerable importance was placed upon the capabilities of the animals to produce milk and butter in large quantities.

"Until recently, in Queensland, the breeders of Illawarra herds supported an Illawarra Dairy Cattle Association, as distinct from the Milking Shorthorn Society, but some little time ago an amalgamation was arranged between the members of the two Associations, and, as a result if this, the two interests were combined under an Association styled 'The Illawarra Milking Shorthorn Society of Queensland.'

"The probabilities are that, as a result of the amalgamation, any distinction that formally existed between the Milking Shorthorn and Illawarra strains of dairy stock will gradually become less obvious as the influence of the Association extends."

COMPARATIVE COST OF CHEESE AND BUTTER MAKING.

In reply to a correspondent asking for information regarding cheese-making as compared with butter-making, Mr. E. Graham, Chief Dairy Expert, Department of Agriculture and Stock, said:

"The statistics in connection with the manufacture of dairy products of different kinds indicate that during the year 1918-19 (the last period for which statistics are available), there were produced in the State 32,371,573 lb. of butter and 8,636,700 lb. of cheese. In the manufacture of butter there were something over 70,000,000 gallons of milk utilised, and about 8,500,000 gallons of milk were utilised in the manufacture of cheese.

In regard to the price of butter and cheese, I have to state that, during the last four or five years the wholesale and retail price of dairy produce has been fixed by the Federal Government, and at present the price of butter in this State is fixed at 228s. 4d. per cwt., and the price of cheese has been fixed at 1s. 1½d. per lb. for cheese of a large size, and at a rate of 1s. 2d. per lb. for loaf cheese. These are wholesale prices.

A fairly accurate basis for calculating the relative price of milk for cheese or butter purposes is to assume that the cost of manufacture of a pound of butter is 2½d. to 3d. per lb., and the cost to manufacture a pound of cheese ranges from 3d. to 3½d. per lb. It takes approximately 2¼ gallons of milk to 1 lb. of butter, and milk of a similar degree in richness will be capable of producing approximately 2¼ lb. of cheese. Usually the price paid per gallon of milk at the cheese factory is slightly greater than the rate paid for milk utilised in the manufacture of butter; but this advantage is counterbalanced, because farmers supplying milk to a cheese factory only receive whey for the purpose of feeding calves and other lower animals, while those supplying cream to a butter factory have the skim milk for stock feeding purposes, and the latter is generally accepted as being twofold the value of whey.

The advantages in the establishment of a cheese factory are that the factory can be erected at a lower cost than that of a butter factory, and in instances where a community of dairy farmers are more or less isolated in a district that is not conveniently connected with a butter factory, the erection of a cheese factory in such cases has been found advantageous. However, there are certain drawbacks in connection with the cheese business that are worthy of consideration. For instance, in the case of supplying milk to a cheese factory, it is necessary that the milk be delivered to the factory daily, and if the roads leading to the factory from the farms for the haulage of the milk are lengthy, this cartage becomes an expensive item. Further, it must be remembered that an appreciable high development of acidity in milk prohibits the milk being manufactured into a cheese of high quality, and I am afraid that, in your district, during the summer months, the milk will frequently be found to develop more acidity than is conducive to the manufacture of a cheese of good quality.

At present the future of the cheese industry is difficult to forecast. The value of cheese in Queensland is generally assessed on the basis of the value of the article for export, Great Britain being the principal purchaser of the surplus cheese of this State. The recent cable advices from London relative to dairy produce in Great Britain infer that the Imperial authorities are extremely anxious to secure all the butter available, both from New Zealand and the Commonwealth. They have not expressed any desire to enter into negotiation for the purchase of cheese, as they consider that the internal production of cheese will be adequate to meet their requirements."

The Horse.

WAR RECORD OF THE SUFFOLK PUNCH.

In previous issues of this Journal we have pointed out the great value of this breed of horses, as fast, active, good-tempered and good-constitutioned as a draught horse, and even as a heavy saddle horse. The "South African Farm Advocate" for 20th June bears the following testimony to "The Great War Record" of a Suffolk Punch:—

"Few horses which have undergone the terrible strain of active warfare in France have as good a record for such hard work and complete immunity from sickness as this Suffolk Punch gelding, who has been with the forces in Northern France pulling heavy guns for 4½ years. During the whole of that time he has not spent even a single day in the sick lines. A Suffolk officer who was in France for the greater part of the war was posted to a division to which this Suffolk belonged, and he naturally became interested in him. The wonderful capabilities of this Punch gelding, compared with other horses, quickly attracted the attention of the Brigade officers, and as he was always at work it became a matter of comment with officers and men. This gelding was purchased in Suffolk early in the war and he was soon out in France, being put to work pulling heavy guns. He has been in 'the thick of it' all through the war, he has outlived his drivers several times, and has never been 'sick nor sorry.' He went through the great fights on the Vimy Ridge, at Arras, and on the Somme, while, as one of his admirers put it, he was several months on the awful tracks on the Ypres salient. In spite of it all, he was never out of action and always looked in the best of condition, carrying plenty of flesh; everyone who saw him remarked upon his condition. This is the report of the officer commanding the heavy battery in which this Suffolk served. Though eight years old, he has now gone into the Army of Occupation. This Punch gelding proved himself an ideal draught horse, and with the help of another horse has pulled 60-pounder guns. After 4½ years it is a great testimony to the Suffolk breed that this gelding should have been sent into the permanent army."

It may doubtless be of some interest to horse-lovers to repeat what we wrote twelve years ago on this breed of horses, based on personal experience in Queensland:—

"Whether the Suffolk Punch will ever reach the position of the most favoured heavy horse is, perhaps, a matter of considerable doubt, but to those who require for their work a fast, active, good-tempered and good-constitutioned draught horse, there is no gainsaying the fact that they might do far worse for themselves than by giving a chance to the handsome and long-lived Suffolk Punch, whose antiquity alone may commend him to their consideration.

"Even as a heavy saddle horse, the Suffolk is a treasure. The writer bought a beautiful, nuggetty, silver-maned chestnut Suffolk from Mr. White, of Bluff Downs, North Queensland, in 1875. A more powerful, docile horse for a traveller could not be imagined. Fast, he was not; but for endurance he could not be surpassed. The proof of this may be shown that, on one occasion, the writer left the late Mr. William Hann's station at Maryvale (N.Q.) at 6 a.m. to make a station only 40 miles distant. Mr. Hann gave directions for a short cut through the bush; but, as it turned out, "the longest way round would have been the shortest way home," for, after carefully following directions, nightfall found the traveller in a piece of waterless broken country, and during the whole day no water had been found. After a fruitless endeavour to track the footsteps of a shod horse on the bank of a dry gully, it was decided to leave the matter to the horse. He set off at a quick walk, which he never relaxed till 4 a.m. the next morning, when he brought up at the first water on Tara station, and then trotted gaily on to Maryvale, a journey of nearly 80 miles. At 8 a.m. he started again, this time in company with the mailman, and reached his destination at 6 p.m., making a journey of 120 miles with only a spell of about two hours, and he was as fresh as a daisy on arrival. Next day he was ridden 30 miles a day to the Etheridge, *viâ* Gilberton, and returned to Townsville, after three days' spell at Georgetown, as lively and in as good condition and temper as if he had only had a day's outing. That horse cost £25, and he was worth £50. Now, here is an

account of this breed of horses which must convince anyone that the Suffolk Punch is the horse, *par excellence*, for the farmer, taken from a paper by Mr. A. Jacques,* of Lamerton, Alberta, Manitoba:—

"Perhaps, in the eyes of the ordinary visitor to an agricultural show, there is no variety of the so-called heavy horse more attractive than the Suffolk. The breed, moreover, comes as somewhat of a novelty to many persons, for, in spite of the great claims possessed by the Suffolk upon the suffrages of the agriculturist and the townsman, it is still in East Anglia that his merits are most keenly appreciated, and, in fact, the farmers in that part of the country prefer the Suffolk to any other breed of heavy horse.

"It is still, however, against the breed that the proportions of a Suffolk do not equal those of a Clydesdale or a Shire horse, many persons being thereby led away into a belief that the east country animals are proportionately weaker than the others; whereas those who are best acquainted with their merits entertain the opinion that considering his height—16 hands 1 inch is the recognised limit of stature in connection with this breed—the Suffolk is quite as powerful an animal as any other breed of horse in existence.

"Probably, therefore, if he were better known in Western Canada, the Suffolk would considerably increase the circle of his supporters; but, in the face of the patronage that is now being extended to both Clydesdales and Shires, the development of the Punch will be for a time retarded. Nevertheless, he is holding his ground in many other countries, and is being largely sought after by the Germans, Austrians, and Russians, to be used in their Government studs for the purpose of crossing and getting artillery horses. No doubt this horse has not the weight or power to draw through crowded streets heavy lorries and other such cumbersome vehicles when loaded to their utmost. Such duties lie far more within the province of the Clydesdale or the Shire; but, in front of a plough, with a good man behind it, a pair of Suffolks can get through a day's work that should amply satisfy the requirements of any reasonably-minded agriculturist. Then, too, for the lighter class of goods traffic in towns, the Suffolk is a very suitable horse; he is so much more active than the Clyde or Shire, in addition to being faster than either, that he can get through a day's work in a comparatively light wagon far better than they.

"The precise origin of the Suffolk is, like that of most ancient breeds, enshrouded in obscurity; but, at the same time, the antiquity of this horse is absolutely beyond all question. So far back as the year 1720 allusions to the breed in the Ipswich Journal are so frequent as to render it certain that it was firmly established at that remote period. Indeed, it is asserted by some that the Suffolks were cultivated as a distinct breed 500 years ago, by crossing the old Norman horse with East Anglia mares; though, it must be observed, in justice to other breeds of less remote antiquity, that the proofs of such assertions are insufficient. Be this as it may, the fact remains that the Suffolks of the present day can boast of pedigrees that extend back as far as 1768, at which period there existed a notable but nameless stallion belonging to one Crisp, a resident of Ufford, near Woodbridge.

"Of course, no colour of coat other than chestnut is admissible in an animal that is desired to enter for the Suffolk Stud Book Association, it being distinctly laid down that, though the shade may vary, there is no place for any horse save chestnuts in the Society's official volume.

"In addition to colour, the Suffolk is distinguished from the Clydesdale and the Shire horse by the fact that he is a clean-legged animal, and does not possess the extreme amount of feather that is so much sought after by breeders of these varieties. This circumstance may very possibly be accepted as an additional reason for the slowness which has characterised the headway made by the Suffolk in Canada, for it seems that the majority of agriculturists in this country are great advocates of hair and bone, and a general belief prevails that if hair is absent on a heavy horse's legs, bone is certain to be deficient likewise. This, however, is not generally accepted by the breeders of Suffolks, who support their contentions by measurements, and assert that their favourite horse—that is, when his height at shoulder and general bulk are taken into consideration—is fully the equal of his heavier rivals as regards the amount of bone he possesses below the knee. As a case in point, Mr. Hume Webster refers to Mr. Alfred J. Smith's champion stallion Wedgwood, who, at the time he wrote, was five years old, and measured 7 feet 10 inches in girth and 10¾ inches

* Mr. Jacques is a breeder and importer of these horses, and has in the past two years imported direct from England 17 Suffolk Punch horses and 30 Suffolk sheep.

below the knee—a very considerable measurement, when it is remembered that there is no hair included in the dimension given. Wedgwood, it may be stated, was foaled in the year 1886, and was the winner of championship at the show of the Royal Agricultural Society of England.

"The Suffolk, moreover, is credited with a very enviable reputation for being a good horse so far as the soundness of his feet is concerned, and consequently it is claimed for him that he lasts longer upon the stones of a town than any other variety that is put to the same class of work. Longevity, indeed, is one of the chief claims that Suffolk breeders insist upon making for their horses. As an instance, it is stated in the Society's stud book that at one of the exhibitions held by the Suffolk Agricultural Society, a brood mare, aged 37 years, was amongst the competitors, and at that time she was accompanied by a sucking foal. Julian's Boxer travelled as a stallion for twenty-five seasons. The dam of Lofft's Cupbearer, owned by the Rev. O. Reynolds, of Leabeach, was one of the sixteen foals which her owner had bred from her dam in sixteen years, and the mare from which Rising Star, the first prize horse at Leeds in 1861, was bred, was 22 years old when the colt was foaled. These are a few instances of the longevity and vitality of the Suffolk horse, and these could be multiplied many times were it necessary to do so, but enough has probably been written to convince the reader, if he were unacquainted with the fact before, that the breed now under consideration is a very remarkably long-lived and fruitful one.

"The extreme docility of the breed is another great point in its favour, as it is something for an owner to feel that he possesses a strain of horses that rarely, if ever, develop vice; but, on the contrary, are usually endowed with the sweetest of tempers and generosity. That the Suffolk is a very willing horse is rendered quite apparent by a visit to any farm upon which he is employed. Unlike many chestnuts, too, the natural gameness of the Punches is not neutralised by hot-headedness or vice of any kind.

"On the contrary, they are a somewhat phlegmatic dispositioned variety, though they possess an amount of courage which enables them to face and endure the hardest of work. Above all things, he is an agricultural horse; but, where pace and strength combined are required, as in the case of town work, he is equally at home. Beyond all question of doubt, he is the most nimble and active of all the so-called heavy varieties, whilst the Suffolk, for his size, is an extremely small feeder, and will flourish and look well upon an amount of food that would be totally insufficient for many other big horses.

"The head of the Suffolk Punch shows more breeding and quality about it than that of any other heavy horse, a very conspicuous feature being the eye, which is full of expression, yet mild and intelligent-looking. The neck is powerful and well formed, and the crest beautifully turned. The headpiece is well carried; the shoulders, which are very long, lie rather forward, this being desirable for the purpose of draught. The chest is wide and deep, the girth of the middle-piece being very considerable, while the body, as a whole, is long and substantially built. The back is very strong, the hindquarters long and heavy, and close coupled with the loin, the legs standing well under the body. The fore-legs—a very essential point, for however good an animal's top may be, he will be worthless if he has no legs and feet to carry him—must be short and flat, possessed of plenty of hard bone, big and free from feather, whilst the pasterns are short and powerful with little hair on them, the feet being of a good size and truly shaped. In general appearance, the Suffolk Punch is very happily ascribed as being long, low, and wide, and this summary of his outline cannot possibly be bettered:—

"'The Suffolk is an excellent mover, with a smart, quick step, a true balance all round at the trot, and a magnificent walker.' As may be naturally supposed, an ultra-high flashy action is not desired, and it is naively added than 'a horse weighing a ton, bending his knee up to his throat-latch, and striking the granite with his feet like a sledge-hammer, is not an exhibition that the Suffolk trader delights in.' In fact, a Suffolk that is heavy enough for the largest dray is seldom, if ever, called upon for an exhibition of speed and high action. Even if he is only up to ordinary van work, he is never likely to be wanted to go more than seven or eight miles an hour, and this class of animal will never scale a ton.

"The Suffolk Punch is now being introduced for farm purposes by the Department of Agriculture and Stock, the first lot having been obtained from Mount Mundance, and we shall not be surprised to learn that before long the farming community will have appreciated the splendid qualities of the breed as active, enduring, docile animals, for the plough and the country wagon."

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JUNE, 1920.

The third month's laying shows a good many changes in positions. The laying for the last week of the month has been exceptional. In some cases the number of eggs laid during the last week is more than a third of the month's total. This can be attributed to the very mild weather—a decided change from the frosts experienced in the early part of the month. Very few cases of broodiness have occurred, and the health of the birds has been excellent, there being no deaths to report for the month. The following are the best individual scores for the month:—E. F. Dennis (Black Orpington), C., 28 eggs; Dr. E. C. Jennings (White Leghorn), F., 28 eggs; J. E. Ferguson (Chinese Langshan), E., 24 eggs in the 30 days. The pens owned by E. F. Dennis and D. Fulton each laid 137 eggs in the heavy section. It is to be hoped that the birds will now continue in their improved output, and not resort to their former practice of reducing the yield as soon as a few days of indifferent weather occur. This has been particularly noticeable in the light section. The following are the individual records:—

Competitors.	Breed.	June.	Total.
LIGHT BREEDS.			
*G. Trapp	White Leghorns	119	339
*O. W. J. Whitman	Do.	125	338
*Haden Poultry Farm	Do.	123	333
Geo. Lawson	Do.	123	315
*S. McPherson	Do.	125	314
*J. D. Newton	Do.	112	313
*J. J. Davies	Do.	116	311
*W. Becker	Do.	109	306
*T. Fanning	Do.	110	296
*J. H. Jones	Do.	90	294
*J. M. Manson	Do.	126	290
*Quinn's Post Poultry Farm	Do.	115	289
*G. Williams	Do.	94	285
*H. Fraser	Do.	108	281
*W. and G. W. Hindes	Do.	92	277
*E. A. Smith	Do.	107	269
*Dr. E. C. Jennings	Do.	112	266
*S. W. Rooney	Do.	100	257
S. L. Grenier	Do.	107	256
A. J. Andersson	Do.	98	256
*Range Poultry Farm	Do.	99	255
*Mrs. L. Henderson	Do.	97	245
Thos. Eyre	Do.	76	241
*B. Chester	Do.	97	239
*Mrs. L. F. Anderson	Do.	109	233
*Thos. Taylor	Do.	88	232
*L. G. Innes	Do.	107	225
W. Morrissey	Do.	99	227
*N. A. Singer	Do.	76	223
C. M. Pickering	Do.	80	219
E. Chester	Do.	93	212
Mrs. R. Hodge	Do.	87	208
Avondale Poultry Farm	Do.	70	202
C. Langsbecker	Do.	96	201

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	June.	Total.
LIGHT BREEDS—*continued.*			
Miss E. M. Ellis	White Leghorns	99	193
H. P. Clarke	Do.	71	191
R. C. J. Turner	Do.	91	189
C. H. Towers	Do.	66	185
S. Chapman	Do.	66	149
W. D. Evans	Do.	39	146
H. A. Mason	Do.	44	128
C. A. Goos	Do.	43	125
HEAVY BREEDS.			
*R. Holmes	Black Orpingtons	129	375
*D. Fulton	Do.	137	359
*A. E. Walters	Do.	116	321
*R. Burns	Do.	111	315
*E. F. Dennis	Do.	137	311
H. M. Chaille	Do.	111	308
*E. Morris	Do.	119	299
*W. Smith	Do.	124	289
*T. Hindley	Do.	109	282
*R. Shanks	Do.	91	272
*Nobby Poultry Farm	Do.	107	269
*A. Gaydon	Do.	120	263
*R. B. Sparrow	Do.	97	245
*E. Oakes	Do.	124	245
G. Muir	Do.	52	217
J. E. Smith	Do.	109	217
R. C. Cole	Do.	111	213
*J. E. Ferguson	Chinese Langshans	78	212
Parisian Poultry Farm	Black Orpingtons	108	208
*E. Stephenson	Do.	92	200
Mrs. G. H. Kettle	Do.	110	198
*J. A. Cornwell	Do.	83	171
G. Flugge	Do.	50	98
Total		6,429	16,240

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	61	50	60	57	60	81	339
O. W. J. Whitman	54	50	62	52	59	61	338
Haden Poultry Farm	65	42	66	59	48	53	333
S. McPherson	55	50	53	53	60	43	314
J. Newton	67	47	55	37	48	59	313
J. J. Davies	54	53	49	64	43	48	311
W. Becker	53	57	58	45	37	56	306
T. Fanning	15	54	49	56	59	63	296
J. H. Jones	53	50	55	54	57	25	294
J. M. Manson	52	48	62	41	40	47	290
Quinn's Post Poultry Farm	59	55	58	46	34	37	289
G. Williams	43	52	47	49	56	38	285

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued.*							
H. Fraser	45	33	53	52	54	44	281
W. and G. W. Hindes	53	48	37	51	34	54	277
E. A. Smith	47	40	53	44	47	38	269
Dr. Jennings	42	55	37	43	38	51	266
S. W. Rooney	30	25	59	45	47	51	257
Range Poultry Farm	37	41	44	59	31	43	255
Mrs. L. Henderson	27	39	46	39	56	38	245
B. Chester	43	24	44	46	44	38	239
Mrs L. E. Anderson	57	45	54	31	25	21	238
Thos. Taylor	54	44	27	38	32	37	232
L. G. Innes	12	35	55	33	56	34	225
N. A. Singer	34	36	42	55	29	27	223
HEAVY BREEDS.							
R. Holmes	63	62	60	60	65	65	375
D. Fulton	65	62	51	43	63	75	359
A. E. Walters	52	54	31	72	49	63	321
R. Burns	53	30	66	46	65	55	315
E. F. Dennis	41	40	74	48	41	67	311
E. Morris	51	54	60	32	43	59	299
W. Smith	50	65	64	58	31	21	289
T. Hindley	49	62	53	63	24	31	282
A. Shanks	24	33	55	65	22	73	272
Nobby Poultry Farm	43	70	24	69	43	20	269
A. Gaydon	45	67	42	14	34	61	263
R. B. Sparrow	53	0	58	57	26	51	245
E. Oakes	33	48	60	17	48	39	245
J. Ferguson	26	42	29	43	52	20	212
E. Stephenson	59	41	32	40	19	9	200
J. Cornwell	31	59	26	0	17	38	171

CUTHBERT POTTS,
Principal.

MORE MUSCOVY DUCKS SHOULD BE RAISED FOR THE TABLE.

By R. T. G. CAREY (Muscovy Breeder), Beerwah.

One of the most neglected lines in present-day poultry culture, is the decided lack of appreciation of the household value or the use of these aquatic domestic birds for table purpose—Muscovy ducks.

The raising or the breeding of muscovy ducks with such abundant flesh for market purposes is proved to be a highly profitable investment, as well as a means of economising the butcher bill, also one of the most economical primary lines of poultry culture which is extremely easy to increase to a large scale whether on free range or by close pen method. Duck culture may be specialisation, but has, in many cases, become a remunerative factor in conjunction with dairying, farming, and poultry pursuits, inasmuch as it is natural to presume that poultry-keepers know that choice muscovies are in great demand among those who like good living; and it is also natural to presume that those who freely eat other kinds of poultry are led to choose those birds for the table-d'hôte and home table. But, so far from that being the case, a very large proportion of our population never have tasted either fowl or duck.

Do not the foregoing statements show the extent of the neglect there is in raising those domestic waterfowls?

I have just concluded a country tour, during which I visited markets, made inquiries from fellow-travellers of all grades of callings, from the farmer and the humble cottager, finding poor supplies at the markets, the "man-on-the-land" uninterested, and the cottager lacking enthusiasm, in poultry culture. The waste of table offal in quantities wilfully dumped away would maintain a pen of birds, fowls, or ducks, it being thus turned into profit represented by a well-fatted dressed carcass on a dining table, to say nought of the delicious flavour of the duck.

What! Is not such great neglect and want of interest bad, when with such a magnificent climate and extensive country as ours we are so slimly represented in duck culture?

Wake up! Arise out of your drowsy slumber; begin and appreciate the advantages of growing a few ducklings for the family table.

On the farm or in the back yard they can be raised, cheaply and easily; the wife, maid, or hireling may easily feed and water the dozen ducklings. The birds adapt themselves extremely well, both in small quarters as on broad acres.

Muscovy ducks for the family table will give the most satisfaction if hatched late in the season, so that the care necessary for them and the attention that may be required for chicken-rearing will not clash. Furthermore, there will be more waste food for late ducklings than for the early ones, and young juicy ducklings for Sunday's dinner will be available when cockerels are out of season, and ducklings grow so quickly.

Should you contemplate hatching ducks for the home table, this is less difficult than hatching for commercial purposes, and hens could perform the work, as the fewer number are more easily attended to, there being no condition of trade supplies or fanciers' demands to hamper one's whole time.

Muscovy ducklings, in foraging, hunt principally for animal food; they take an occasional nip at any tender green herb in their way; and when insects and worms become scarce they will turn to the herbage more eagerly. As long as animal or insect food is abundant on their range, and they get a little mash morning and evening, a few ducklings in a garden will do very little damage to vegetables; but beware that you do not let elderly ducks thereon, because results would be disastrous.

TO PREVENT IRISH BLIGHT IN POTATOES.

Mr. A. H. Benson, Director of Fruit Culture, in a communication to the Press in July last, on the prevention of the above fell disease of the potato, particularly emphasised the necessity of prevention rather than of cure. In the issue of December, 1919, of this Journal, we drew attention to a recommendation in the "Agricultural Gazette," England, of a spraying mixture of a 1 per cent. solution of either burgundy or bordeaux mixture to prevent potato blight. The most successful treatment was found to be spraying with a 1 per cent. mixture before any disease appeared; then using a 1½ per cent. mixture in about a fortnight if it appeared, followed by a 2 per cent. application if the disease becomes persistent. Many English farmers, however, use the 1 per cent. solution all through the season.

Mr. Benson, referring to the appearance of Irish blight in the coastal districts, said that he desired to direct the attention of potato and tomato growers to the necessity for taking every possible precaution against this trouble, the recrudescence of which has been brought about by the prevailing muggy weather. Care is specially necessary, because the main planting season for potatoes will commence at the end of this month, or in the following months, according to the locality, and nothing should be omitted which would tend to prevent the ensuing crop being affected. Irish blight is a disease that can much better be prevented than cured. The known preventive measures have been proved to be efficacious, as was shown in Great Britain during the recent war. In another instance at Circular Head (Tasmania), one planter who treated his seed potatoes, and sprayed the crop systematically harvested a crop of seven tons to the acre, and on the other side of a two-rail fence, another grower, with exactly the same soil, seed, and conditions, had his crop attacked, and did not harvest a single tuber.

With regard to the present outbreak, Mr. Benson warns growers to take special care to pick over all potatoes carefully before sending them to market. He points out that, if after arrival at the market the potatoes are found to be infested, they will be picked over at the grower's expense. The diseased potatoes will be destroyed, and the balance will only be permitted to be sold for town consumption under special conditions. It will, therefore, be very much to the advantage of the grower to see that nothing but sound potatoes or tomatoes, are sent to market. If they are picked over on the farm, the diseased tubers can be fed to the pigs.

Botany.

NOTE ON VARIATION IN THE BARK OF TWO COMMON EUCALYPTS.

By C. T. WHITE, F.L.S., Government Botanist.

One of the commonest Eucalypts of South-eastern Queensland is *Eucalyptus hæmastoma* var. *micrantha*, commonly known as either the "White" or "Scribbly Gum," the latter given on account of the peculiar scribble-like markings that occur on the trunk and seem more or less confined to this tree, and caused probably by insect or mite attack. The tree exhibits a certain amount of variation in the character of its bark, the most usual type being a pure "candle" white with the characteristic scribblings, the outer dead bark being shed in thin strips or patches as in fig. 1. Often growing alongside the trees with the white bark are others with a bark indistinguishable from that characteristic of *E. tereticornis*, "blue gum" of Queensland or "forest red gum" of New South Wales; such a tree is illustrated in fig. 2. Rarely the outer dead bark may be persistent on the trunk for a considerable distance, but eventually comes off in the characteristic strips or patches.

In January, 1919, when attending the schoolboys' camp at Toowoomba for the purpose of lecturing on native plant life, I was puzzled about the identification of a eucalypt known to everyone locally as "stringy bark." A good series of specimens was obtained and I was surprised to see that from leaves, flowers, and fruit (ordinary herbarium specimens) it was quite impossible to separate the tree from *E. hæmastoma* var. *micrantha*. Last January (1920) I again visited the schoolboys' camp at Toowoomba, and made a special feature of studying this tree and failed to find the more typically-barked form in the locality, all the trees observed carrying a typical "stringy bark," leaving the topmost branches bare. To all intents and purposes, the tree is a typical stringy-bark, and goes under that name in the district. It is not customary to name distinct varieties according to the nature of the bark, and the practice is not one that can be generally followed, especially among eucalypts, where often considerable variation exists in the bark of a single species. In this case, however, where there is a wide difference, and all the tress in a certain locality bear a bark markedly different from that of the common form, one feels justified in giving a distinct varietal or specific name, and for the Toowoomba tree, I would propose the name:

> *Eucalyptus hæmastoma*, sm. var. *inophloia* n. var. "Gum-topped stringy-bark." Trunk and main branches clothed with a persistent, fibrous bark; leaves, flowers, and fruits as in the variety *micrantha*. Habitat: Ranges about Toowoomba, Queensland. *C. T. White.*

For the past few years, as time permits, I have been paying some attention to the eucalypts of the Brisbane district, and have found the narrow-leaved blue gum (*Eucalyptus seeana, Maid.*) to be fairly well distributed over the area. As a general rule, in the character of its bark this tree can scarcely be distinguished from *Eucalyptus tereticornis*, and often in appearance is intermediate between that species and *E. propinqua*, but during the course of collecting trips I have met with one tree growing on the Chermside hills (about 6 miles from Brisbane) bearing a thick, light, flaky, persistent bark almost up to the topmost branches; but in this case, knowing only a single tree, one does not feel justified in naming it as a distinct variety. Some botanists may take exception to the naming of the new variety of *E. hæmastoma* here proposed, but distinct variation in bark has surely just as much right to varietal value as the presence or absence of hairs on either leaves, twigs, or flowers, which variable feature is often used as one of distinct varietal value.

PLATE 3.

1 AND 2.—EUCALYPTUS HÆMASTOMA, VAR. MICRANTHA. "WHITE" OR "SCRIBBLY GUM," SUNNYBANK, NEAR BRISBANE.
3.—EUCALYPTUS HÆMASTOMA, VAR. INOPHLOIA. "GUM-TOPPED STRINGY-BARK," TOOWOOMBA.

PLATE 4.

1.—EUCALYPTUS SEEANA. NARROW-LEAVED BLUE GUM, BRISBANE RIVER.
This is the normal and characteristic appearance of the tree.

2.—EUCALYPTUS SEEANA, CHERMSIDE, NEAR BRISBANE.
This tree carried its flaky bark almost to the topmost branches, and is a remarkable variant from the type.

Science.

THE ERADICATION OF PRICKLY-PEAR.

By W. S. CAMPBELL, Retired Director of Agriculture, New South Wales.

Some years ago, whilst I was in charge of the Forestry Department as well as the Agricultural Department in New South Wales, efforts were being made to eradicate the prickly-pear, which had then spread over a considerable area of land and was gradually advancing and causing the land to become useless. Spraying with poisons (arsenic, scrub exterminator, and others), a machine to smash up the pear, heavy rollers, and burning were all being tried more or less effectively. It seems to me that the only reliable work was effected by fire; but, of course, unless timber was plentiful and labour available to cut and heap up the pear, this was impracticable. It was adopted most effectively here and there on a small scale.

In one district (Gloucester), where the pear was scattered about in small clumps here and there, the Forester in Charge, the late Mr. Rudder, who was very keen on getting rid of the pest, coped with it satisfactorily and, I believe, eradicated the pest from his district, by causing every particle of pear he could discover to be burnt. There was abundance of firewood available in the district. Whether the pear has been allowed to spread since Mr. Rudder's death, I do not know.

Various methods to eradicate or prevent progress of the prickly-pear have been experimented with in Queensland, I believe, but ineffectively—the cochineal insect (and most unlikely to be of any use whatever), sprays of various kinds (kerosene flare and others), including burning off, which is quite impracticable in most places affected.

The one and only method which, I am convinced, will keep the pear in check, and ultimately eradicate it, is the application of intense heat, which I feel sure could be practically applied. The heat "formed by the combusion of 1.7 volumes of oxygen and 1 volume of acetylene," 3,482 degrees C., applied by means of a large specially constructed blow-pipe, or even a heat of 1,000 degrees C. to the prickly-pear, would melt it away like wax—plant, seeds, roots, and all.

This may seem to be, perhaps, a visionary project, but it is not so visionary as must have been that of the application of heat to work machinery, the invention of the aeroplane, or the application of electricity to the telegraph, the telephone, and domestic requirements.

To eradicate satisfactorily the prickly-pear in Queensland, or even to check its further progress, should be worth a million or even two million pounds sterling, and if the means suggested shall prove effective, although perhaps expensive, it will be worth while adopting it.

CANE PLANTING IN JAVA.

"The South African Sugar Journal" for May, 1920, states that Java is planning to raise 156,971 hectares* (about 353,184 acres) of cane in 1920. In 1919 it was 137,031 hectares. The number of factories in operation in 1919 was 180; the year previous, 186. The sugar output for 1919 was 1,340,926 tons, which was 24.6 per cent. less than in 1918, when it was 1,778,207 tons. Thus, the 1920 increase will be 14.6 per cent. over that of the previous year.

* 1 hectare = about 2¼ acres.

Natural History.

FLYING FOXES.

LIFE HISTORY, HABITS, &c.

By H. TRYON, Government Entomologist.

Our five species of flying foxes are apparently identical are regards their general developmental history and habits of life.

Being largely nocturnal, and not thriving long under conditions of confinement, the average duration of their lives, the age when breeding is commenced, the period of gestation, the total of their individual progeny, are matters that have eluded observation, although these have an important economic bearing in considering the problem arising from their depredations.

The evidently have, as a rule, however, but a single young one. This after birth is transported by the female, clinging meanwhile to its under-surface, the mother animal suckling it in the ordinary way.

Both sexes are principally nocturnal, and remain stationary during the hours of daylight, hanging suspended with the head downwards, from vine or tree-branch, by means of the toes armed, as they are, with sharp curved claws. Meanwhile, the ample wings of the animals (webs that unite their long fingers, and the fifth of these, with the side of the body and inner face of the hind leg on each side), are folded across their under-surfaces.

During this time of rest they manifest a striking social habit, living in colonies of ten—as regards numbers—of prodigious size, comprising in fact, many thousands of individuals.

These "camps" occur in dense scrubs, or on islands, or on the shores of estuarine waters, and in other spots also where, too, there may be a rich growth of mangroves or other trees. The spots that are usually selected for their camps are where quietude reigns, as in the gullies of our tree-clad coastal ranges.

Whilst thus inactive, they hang packed together side by side, in continuous or little broken rows along the length of branches or vines; the masses of these huge bats not only bend downwards their perches, but oftentimes cause fairly large branches to yield to their combined weight and break off. Moreover, in long occupied camps, the tree-tops they occupy thus soon become also almost denuded of their foliage.

The population of these large camps, again, is not always constant, since at certain times of the year they may originate secondary colonies that are temporarily established in more or less remote spots.

Although a single camp may serve to people an area of many square miles, it may happen that more than one large camp may occur at no great distance apart from another. Two such camps were met with "below the Range," one near Helidon, the other near Blackfellow's Gully.

The smaller or secondary camps usually occur nearer settlements than do the principal ones, sometimes, indeed, in the heart of the coastal towns, especially where clumps of bamboos or large umbrageous trees are to be met with, and fruit-yielding gardens are not far distant.

Further, individual flying foxes, or small groups of two or three, may remain during the day in the trees that have yielded them fruit, and under these circumstances, though large objects, looking (as they do when posed as asleep) so unlike any animal, their presence is easily overlooked.

In their camps, however, they are never all sleeping at one time. Then they may be observed at times shifting their position, moving their heads to one side, as if listening, scanning the prospect with their bright eyes, or detaching one of the legs by which they are supported to scratch any allay the irritation of some nyctirebid parasite.

The neighbourhood of a camp of flying foxes is, as a rule, first revealed by the strong unpleasant odour that emanates from certain glandular organs they possess; and, on a nearer approach, their shrill cries further compel attention.

Although apparently at rest, they are all evidently very nervous and wakeful, and hence take wing, rising into the air *en masse* on the least disturbance—the firing of a gun, or the shying of a stone, for instance—and, being able to see by day as well as by night, they, on these occasions, move off to a considerable distance before settling down again.

At sunset, however, they habitually leave their camps, and with such concerted action and promptitude as regards the main body, that the sky, when they rise and issue forth, is almost darkened by their presence; and moreover, although the individual flying fox travels noiselessly through the air, in this combined movement, a sound is produced that has been likened to the beating of the air by some huge fan-like instrument.

But although setting forth together, they soon separate into little bodies that usually pursue a direct course, high aloft, like some big birds speeding to their roost or to their chosen feeding grounds.

Wide expanses of ocean, as between mainland and island, may even thus be passed over.

The fruit-yielding trees of scrub and forest are now their principal quest, and they appear to favour the indigenous figs of one kind or another growing, not only in the scrub lands, but also when planted in our streets and gardens.

They are also very fond of honey-yielding flowers, especially those of our Eucalypts, and one may see the ground beneath one of these trees, when in bloom, freely strewn with leaves and branchlets after one of their nocturnal visitations. (*Note.*—This appetite for honey, exhibited apparently by all our flying foxes, and that may be availed of for exhibiting a poison fatal to the consumer, is a feature that the less common of our South Queensland flying foxes especially manifests.)

The flying fox's food is contributed by the product of many of our cultivated fruit trees, and its exercise of its partiality for these is the gravamen of the charge against it. It specially favours those that are sweet and luscious; but notwithstanding, the members of the citrus tribe, though possessing this quality, are often avoided by them. Their dietary with regard to cultivated fruit is, however, very wide. On occasion, these fruit bats will resort to the surface of the land and partake of pine-apples, and an instance of their attacking ripening maize is well authenticated.

This habit of attacking cultivated fruit is especially manifested when the native sources of supply fail, as during periods of protracted drought, and it is then that complaints regarding the flying fox's depredations are principally voiced.

This fruit-destroying habit may be exercised to a very serious extent, at times even an entire crop being removed by them. Moreover, the entire eastern portion of the State at one time or another witnesses their ravages in orchard or plantation.

It is, again, a common remark that their depredations are yearly becoming more pronounced, whilst the extent of country that witnesses them is ever widening, this fact proving that they are migrating to previously unvisited "pasture grounds." This is accounted for by the destruction of their "haunts," and the felling of their natural food-yielding wild fruit trees to meet the needs of further and further settlement on the land. Temporary extension of their range of occurrence is also to be explained by temporary uncongenial meteorological conditions.

The damage that they occasion is not confined to what they consume only; they only chew and then reject a great deal of fruit, leaving this either upon the tree yielding it, or on the ground beneath. At the same time, although so nice in their requirements in regard to the condition of fruit as to ripeness and flavour, especially when the yield is generous, they will at all times eat unripe fruit, as well as even the sour acrid immature mango. In addition to consuming fruit, they will also damage it with their sharp claws in clambering amongst it.

When about to feed in a fruit tree, and having alighted upon it, they clamber all over its branches, in order to explore them to find what they are seeking and exercise their choice. In this procedure, they grip the branches with the stout curved claws that terminate their thumbs, reaching forth and fastening on to one object after another with their aid; and not using in these procedures the claws of their well-developed feet only. They also expand and make use of their wings, when

special movements in the tree-tops necessitate this. Thus they are veritable acrobats when so engaged.

Then, again, on these occasions the different individuals quarrel and fight with other flying foxes that they may meet, and uttering meanwhile their ear-splitting shrieks. Love quarrels, as well as mere cupidity—as it seems—impel them to thus vociferate.

Generally they feed on the tree that is yielding them the fruit that they have discovered, rejecting apparently—in the case of wild figs or stone-fruits at least—parts that they cannot digest (seeds, &c.). However, the process with them is evidently soon perfected.

At times they carry fruit bodily away, at least for some distance.

By the eversion of their inner membranes, the flying fox's nostrils are very protuberant, and are at the same time separated by a groove. This eversion of the inner sensitive part, evidently too greatly enhances their sense of smell, and as one may infer from observation, also their sight, too, at night is very acute. This circumstance doubtless contributes to the discovery of the existence of the definite fruit-bearing trees they visit, and not only their inherited experience.

All night long, successive visits may be made to a tree once found, either by the same animals by way of repetition, or by different ones that are attracted to the spot, especially by the noises emanating from the earlier depredators.

With the approach of dawn, the animals leave the orchards or individual trees, and repair to the camps or secondary settlements, whence on the previous day they originated, prepared towards nightfall again to come forth and commit further havoc.

The myriads of flying foxes met with in the large camps, the voracity with which they feed, and the comparative paucity of wild fruits, originally suggested to the late G. Krefft, amongst other naturalists, that these fruit-eating bats share, in some respects, the habits of other *Chiroptera*, and partake to some extent of an insect diet. I am not, however, aware that any facts have been ascertained to support this opinion.

The sickness to which, under natural conditions of life, they are subject have not been ascertained. In January, 1905, a very great fatality came under the notice of an observant correspondent (L. Franzen) as occurring in a large flying fox camp at Helidon that he frequently visited. In fact, the area occupied was unapproachable awing to the stench arising from those animals that had already died and become corrupt. This, at the time, he attributed to the very high temperature of the air that had occurred on 1st January of that year.

POISONING WHITE ANTS.

Many methods of destroying white ants have been proposed; some of value, others useless. In the "Pastoral Review" for last June, we find the following remedy, advocated by Mr. W. W. Froggatt, New South Wales Government Entomologist, for the protection of timber against the ravages of these destructive pests: —

"A poison bait, generally effective, may be made by the admixture of an ounce of arsenic to a pound of treacle, but I would recommend that arsenite of soda (in similar quantity) be substituted for that ingredient. This should be dissolved in hot water, and then mixed with the treacle. The bait is poured into the woodwork of floors or joints which are not going to be removed, but which may be harbouring the ants; it percolates through any damaged wood, and coats it with poison. A mixture of 1 oz. of paris green and 1 lb. pollard, brought up to the consistency of putty by the addition of a little sweetened water, has also been found useful. This should be forced into the wood it is not desired to remove."

Mr. J. C. Brünnich, Queensland Agricultural Chemist, gives the following suggestions on White Ant Destruction in the case of fence posts:—

"If the posts are not hollow, it is sufficient to clear away the soil from the posts to the depth of about 12 inches, and then liberally sprinkle the soil near the posts with ordinary arsenic, and fill up the hole. If the posts are hollow, they will have to be bored to reach the hollow core, and the arsenic can be put in by mixing it with water, or by making a solution by boiling the arsenic with an equal quantity of washing soda. As a rule, solution is not required, and the dry arsenic is found quite effective. At any place where the earth-covered tunnels, in which the white ants work, can be broken, and a pinch of arsenic introduced, all the ants will be destroyed in a short time."

General Notes.

MEGGITT LIMITED.

The Company has placed a range of specialised stock food and tonic meals on the market in response to numerous requests received from their Australasian clientele for a perfectly balanced ration which would eliminate all trouble and doubt of mixing.

It has been conclusively proved by both practical and scientific tests that foods ground give better results than unground. Meggitt Limited have handled this matter with their usual thoroughness of detail, and are supplying foods which have no superior in this regard.

All foods are ground to absolute fineness and contain the requisite proportion of protein, carbohydrates and fats essential for their different needs.

Meggitt Limited's slogan is that "by results is cheaper." To establish this claim they have installed the most up-to-date grinding and mixing plant of any food manufacturer in the world. All the ingredients utilized in the manufacture of specialised stock foods and tonic meals are of the very highest quality and must measure up to their standards before being passed on to the manufactory department.

Each and every component part of the raw material is submitted to their chemists and undergoes rigid laboratory tests before being accepted as suitable for preparation of stock foods and tonic meals.

Included in the range of tonic meals is a parasitic preventive which is invaluable for worm infestation of the stomach and intestines. It also performs the important function of eradicating so-called "blood worms." The regular use of tonic meal for horses will prevent colic, gripe, and impaction.

By maintaining dairy cattle in good health their milk yield is materially increased. Tonic meal for cattle by increasing the general health of your stock and preventing such ailments as dry bibble, impaction of the third stomach, and indigestion is necessarily a boon to dairymen.

Pig-owners are also catered for with pig tonic, which should be in all piggeries. It prevents fermatative changes in the stomach and their attendant troubles. (As prevention is better than cure) pig tonic will fortify your pigs against the ravages of disease, and is an excellent preventative for those common swine ailments, pneumonia and swine fever.

A long felt want by the poultry farmers is supplied in tonic which benefit the entire system, builds new tissue, and rectifies many causes of poultry diseases.

All stockowners confronted with the serious problem of increased cost of production should investigate stock foods which are the ideal concentrate and used as directed will result in increased production.

LONDON QUOTATIONS FOR JULY.

Cotton.—23.87d. per lb.; Rubber, Para, 2s. per lb.; Rubber, Plantation, 1s. 11¾d.; Hemp, dull, £55 per ton; Copra, £44 5s. per ton. Linseed oil is worth £79 10s. per ton.

TANNING SHEEP SKINS.

An American recipe for tanning sheep skins is to apply eight parts of common salt and one part of powdered alum to the flesh side of the pelt. After rubbing in, allow the skin to lie flesh side up on a floor for eight or nine days, and then hang up in the air for a further four or five days until dry. As soon as dry, work the hide with the hands until the inner layers crack and peel off, leaving the soft pelt, with the wool attached. Besides preserving the skin the alum and salt set the wool in the hide.

TO COMBAT RED AND BLACK ANTS.

It is said that if a line of Keating's Powder is drawn on the floor round the legs of a table, no ant will come near it, and should one once come into contact with the powder, that ant dies. At all events, the remedy is simple and worth trying.

UP-TO-DATE ROAD MACHINERY.

In this issue, on page XXI, Messrs W. Lovelock and Company, Limited, the road machinery and road implement specialists, 210 Roma street, Brisbane, invite representatives of municipalities and shire councils who are visiting Brisbane for the Local Authority Conference to call and see their display of road machinery and road implements in their showrooms, 210 Roma street, just past the railway gates.

Messrs. Lovelock and Company are sole agents in Queensland for the All-Steel Western Reversible Road Grader and Western line of Road Machinery.

The Western Road Grader is a very popular grader amongst shire councils, and it has proved itself the king of all graders, being built of all steel. It is a particularly durable road machine, and will stand heavy work and heavy strains, being a reversible grader, fitted with all the latest improvements. It is a grader that can be used under almost every condition. The many advantages of using the Western Road Grader are no doubt well known to most Local Authority representatives. An inspection of the Western Road Grader and Road Machinery will, we are sure, prove interesting.

The Western Road Grader has been supplied by Messrs. W. Lovelock and Company to a large number of Shire Councils and Municipalities in this State. In many cases repeat orders having been received, as a result of the economical working of the first road grader supplied. Messrs. W. Lovelock and Company will be very pleased indeed to give all information with regard to the capabilities of the Western Road Grader and Road Machinery, and will be pleased to have a call from all Local Authority representatives.

SOCIETIES, SHOW DATES, ETC.

BLACKALL.—The Barcoo Pastoral Society. Secretary, W. P. Tilden. Show dates: 13th and 14th July, 1920.

KAIRI (*via* Cairns).—The Kairi Farmers' Progress Association; Secretary, G. H. Hemming.

NORTH PINE.—The Pine Rivers Agricultural, Horticultural, and Industrial Association. Secretary, G. M. Armstrong. The Annual Show of the Association will be held at Lawnton on 3rd and 4th September, 1920.

PHILPOT CREEK, VIA GAYNDAH.—Mundowran Pocket Farmers' Association. Secretary, A. J. C. Mathieson.

WELLINGTON POINT.—Wellington Point Agricultural, Horticultural, and Industrial Association. Secretary, John Burge. Previous Show date postponed to 28th August.

PRODUCTIVITY OF PERENNIAL COTTON PLANTS.

Mr. D. Jones mentions ginning the cotton obtained from Mr. William Howard, Fairfield, Bundaberg, from one plant, six years old, as yielding 8¾ lb. of seed and 5¼ lb. of lint, the proportion of lint being 37½ per cent. As this fibre fully equalled some valued for the Agent-General recently, in Liverpool, as being worth over 4s. per lb., it follows that the value of cotton produced on this plant exceeds 20s.

Sown 12 ft. by 12 ft. apart, there are 302 shrubs to the acre. The fibre represents 5½ months' picking for the half-year. In January, 1921, it is estimated that with the next harvesting the plant will establish a year's record. The quantity of seeds obtained from the shrub (213 to an ounce), 29,820, is sufficient to sow about 30 acres 12 ft. by 12 ft. apart.

Answers to Correspondents.

THE SWORD BEAN.

Mr. Biddle, Sunnydale Farm, Tamaree, asks—

1. Whether the sword bean (dwarf or climbing) can be used for food purposes.

2. Whether the nodules on the roots of the plants, and which are very large, could be collected and used to inoculate fresh ground for other leguminous crops.

3. The name of a bean, which he thinks is the velvet bean, which bears great bunches of beans like dark bananas.

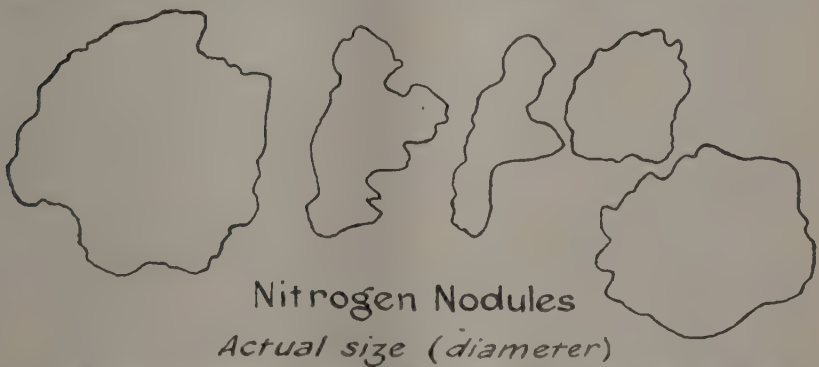
The Government Botanist (Mr. C. T. White) has replied as follows:—

1. The sword bean is edible as a green bean, if treated in the same way as ordinary french beans, but for this purpose must be used when very young. The seeds can also be used when fully formed, but not hard, in the same way as lima or broad beans. The ripe seeds are also said to be edible, but I think care must be exercised in eating the bean in any way, as reports commonly come in of people having been made very ill by eating them, whereas other people have eaten them over and over again without any ill effects following.

2. With a plant like the sword bean, gathering the nodules and distributing them over the ground would not be very satisfactory, but the whole plant should be ploughed or dug in and returned to the soil, when the nitrogen gathered and stored by it would be available for any succeeding crops, leguminous or otherwise.

For inoculating fresh ground, soil taken from a plot which had previously grown these legumes should be taken and applied to the fresh gound where the bacteria become available for those leguminous crops, such as lucerne, beans, peas, &c., but for such crops only.

To understand this, we must know something of the life history of these bacteria which live in the nodules that occur in the roots of leguminous plants.



These bacteria are able to fix the free nitrogen of the atmosphere, and pass it on in the form of nitrogenous compounds which can be utilised by the associated plants as food, this source of nitrogen not being otherwise available to them. On the other hand, the bacteria receive from the green plant the carbon, minerals, and water required for their development, this being a case of true symbiosis, *i.e.*, two different organisms living together, each to their mutual advantage.

These nodule-producing bacteria occur in most soils, making their way through the epidermis into the interior of the root, where they induce an exuberant growth of tissue, resulting in the formation of the well-known root nodules. After a time the bacteria, which on first entering the root tissue are minute rods (bacilli), change their shape and increase considerably in size, and are then termed *bacteroids*. In this form they are gradually absorbed by the green plant and transformed into nitrogenous compounds, which are either utilised by the plant as food, or stored away as reserve material. Numbers of them, however, are returned to the soil, thus providing for the infection of other leguminous plants. It will easily be seen how it comes about that leguminous plants are so valuable as green manures, after the nitrogen stored in them, mainly by bacterial action, is returned to the soil on their decay, when it becomes available to the crops that may afterwards be grown in the same area.

3. The bean referred to is the velvet bean (*Mucuna pruriens* var. *utilis*), commonly grown as a green manure.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY, 1920.

Article.		JULY. Prices.
Bacon	lb.	1s. 5d.
Bran	ton	£10 10s.
Broom Millet	„	£30 to £45
Broom Millet (Sydney)	„	£25 to £50
Butter (First Grade)	cwt.	228s. 8d.
Chaff, Lucerne	ton	£8 10s. to £13 10s.
Chaff, Mixed	„	£9 to £13
Chaff, Oaten	„	£13 10s. to £17
Chaff, Panicum	„	...
Chaff, Wheaten	„	£10 10s. to £10 15s.
Cheese	lb.	1s. 1d. to 1s. 2d.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 10½d.
Hay, Lucerne	ton	...
Hay, Oaten	„	...
Honey	lb.	7d. to 7½d.
Maize	bush.	7s. 6d. to 8s. 8d.
Oats	„	...
Onions	ton	£13 to £17.
Peanuts	lb.	7d. to 9d.
Pollard	ton	£13
Potatoes (English)	„	£16 10s. to £19
Potatoes (Sweet)	cwt.	4s. to 4s. 6d.
Pumpkins	ton	£6 to £8 10s.
Turnips (Swede)	cwt.	15s. 3d.
Eggs	doz.	2s. to 2s. 4d.
Fowls	per pair	5s. to 11s. 6d.
Ducks, English	„	4s. 6d. to 5s. 9d.
Ducks, Muscovy	„	6s. to 9s.
Geese	„	7s. 6d. to 11s.
Turkeys (Hens)	„	12s. to 14s.
Turkeys (Gobblers)	„	20s. to 40s.
Wheat	bush.	...

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar bag	3s. to 17s.
Beetroot, per dozen bunches	9d. to 1s. 6d.
Cabbages, per dozen	4s. to 12s.
Cauliflowers, per dozen	5s. to 16s.
Carrots, per dozen bunches	1s. 9d. to 3s.
Chokos, per quarter case	4s. to 5s.
Lettuce, per dozen	6d. to 9d.
Marrows, per dozen	7s. to 10s.
Peas, per sugar bag	3s. to 11s.
Potatoes (Sweet), per sugar bag	2s. 6d to 5s.
Pumpkins (table), per dozen	3s. to 9s.
Tomatoes, per quarter case	2s. to 7s.
Turnips (Swede), per dozen bunches	1s. 3d. to 2s. 8d

SOUTHERN FRUIT MARKETS.

Article.	JULY. Prices.
Bananas (Tweed River), per double case	10s. to 28s.
Bananas (Queensland), per double case	22s. to 30s.
Bananas (Fiji) per double case	10s. to 28s.
Lemons, per case	3s. to 10s.
Mandarins, per case	12s. to 15s.
Oranges (common), per bushel case	4s. to 8s.
Oranges (Navel), per bushel case	4s. to 12s.
Passion Fruit (Victorian), per case	14s. to 22s.
Pineapples (Queens), per double case	16s. to 20s.
Pineapples (Ripley), per double case	14s. to 16s.
Pineapples (common), per dozen	...
Tomatoes, per quarter case	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	10s. to 15s.
Apples, Cooking, per bushel case	11s. to 14s.
Bananas (Cavendish), per dozen	3d. to 10d.
Bananas (Sugar), per dozen	4d. to 9d.
Citrons, per cwt.	14s. to 15s.
Cocoanuts, per sack	£1 5s.
Cumquats, per quarter case	5s. to 6s. 6d.
Custard Apples, per case	3s. to 6s. 6d.
Gooseberries, per quart	1s.
Lemons (Lisbon), per half bushel case	10s. 6d. to 12s.
Mandarins, per case	12s. to 18s.
Oranges (Navel), per case	10s. to 16s.
Oranges (other)	7s. to 14s. 6d.
Papaw Apples, per case	2s. to 16s.
Passion Fruit, per half bushel case	5s. to 8s.
Peaches, per quarter case	...
Pears, per quarter case	12s. 6d. to 17s. 6d.
Pineapples (smooth), per dozen	7s. to 12s.
Pineapples (rough), per dozen	8s. to 9s.
Pineapples (Ripley), per case	...
Strawberries, per dozen boxes	12s. to 25s.
Tomatoes, per quarter case	3s. to 7s.

TOP PRICES, ENOGGERA YARDS, JUNE, 1920.

Animal.	JUNE. Prices.
Bullocks	£19 to £22
Bullocks (Single)	...
Cows	£13 12s. 6d. to £17
Cows (Single)	...
Merino Wethers	50s. 6d.
Crossbred Wethers	43s. 6d.
Merino Ewes	32s. 6d.
Crossbred Ewes	44s. 6d.
Lambs	37s. 3d.
Pigs (Backfatters)	...
Pigs (Light Bacon)	...
Pigs (Porkers)	70s.

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Farm and Garden Notes for September.

Field.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly prepared ground. Therefore, the cultivator and the horse and hand hoe must be kept vigorously at work to check the weed pests and save the growing crops as well as much future labour. Attend to earthing up any crop which may require it. There may possibly occur drying winds, dry weather, and even very late frosts, which have not been unknown in parts of this State even as late as September. Still, good showers may be looked for in October, and much useful work may be done during the present month which will go far to afford a fair prospect of a good return for labour. Intending sisal hemp growers may now plant out *Agave rigida*, var. Sisiana (sisal hemp plant), in rows 6 to 8 ft. apart, according to the richness of the soil. All dry places on the farm, too rocky or too poor for any ordinary crops, may be planted with this valuable aloe. Especially should limestone country be selected for the purpose. If the soil is very poor, and the plants very small, it is better to put the latter out into a nursery of good soil, about 1 ft. apart. Next year they will be good-sized plants. Keep down tall weeds in the plantation, and do not allow couch or buffalo grass to grow about the roots. Sisal will do no good if planted on low-lying wet land, or on a pure sandy soil. It thrives best where there is plenty of lime, potash, and phosphoric acid, all of which (except potash, unobtainable under present war conditions) can be cheaply supplied if wanting in the soil. Sisal requires so little labour from planting to maturity that it can be grown to good profit despite the high cost of white labour. The price of the fibre now ranges from £50 to £60 per ton. Sow cotton—Sea Island near the coast, and Uplands generally. Sow maize, sorghum, imphee, mazzagua, Indian cane, prairie grass, Rhodes grass and paspalum, panicum, tobacco, pumpkins, and melons, including the Cassaba melon. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, ginger, and canaigre, the latter a tuber yielding a valuable tanning substance. Plant out coffee.

Kitchen Garden.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of these, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case, stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be of great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly dug beds. What the action of salt is, is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile, and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada bean, providing a trellis for it to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts, peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory, provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

FLOWER GARDEN.—Continue to plant bulbs as directed last month. Protect the plants as much as possible from cold westerly winds, which may still occur, notwithstanding the increasing temperature. Be careful that the bulbs do not come in contact with fresh manure. Keep a good lookout for slugs. Plant out chrysanthemums, palms, and all kinds of tropical and semi-tropical plants. If hot weather should ensue after planting, water and shade must be given. Sow dianthus, snapdragon, and coleus, seed or cuttings of the latter. Roses will now be in full bloom. Keep them free from aphis, and cut off all spent blooms. This latter work should be done in the case of all flowers. If you wish to save seeds, do not wait for the very last blooms, but allow some of the very best to go to seed. If you have any toads in the garden or bush-house, encourage them to take up their abode there. They are perfectly harmless, in spite of their ugliness, and they destroy an astonishing number of insects injurious to plants. Fill up all vacancies with herbaceous plants. Sow zinnia, gaillardia, amaranthus, cockscomb, balsam, sunflower, marigold, cosmos, summer chrysanthemum, coreopsis, portulaca, mesembryanthemum, calendula, &c.

Orchard Notes for September.

THE SOUTHERN COAST DISTRICTS.

The marketing of citrus fruits, in the later districts, of the late winter or early spring crop of pines and bananas, also of strawberries and Cape gooseberries, will continue to occupy the attention of fruitgrowers. We can only repeat the advice we have so often given in these Notes respecting the marketing of all kinds of fruit—viz., to grade the fruit evenly, pack honestly, and display it to the best advantage if you want to get good returns.

September is a very important month to the fruitgrower, owing to the fact that it is usually a dry month, and that it is essential in all cases to keep the land in a high state of tilth, so as to retain the moisture that is required by the various trees that are in blossom, thus securing a good set of fruit. Where irrigation is available, it is advisable to give the trees a good watering should the ground be dry, as this will induce a good growth and cause the fruit to set well. If an irrigation is given, it should be a thorough one, not a mere surface watering, and once the land is saturated the moisture must be retained in the soil by constant and systematic cultivation. If this is done, one good watering will usually be enough to carry the trees through in good condition to the thunderstorms that come later or even to the summer rains, if the soil is of a deep sandy loamy nature.

No weeds must be allowed in the orchard or vineyard at this time of the year, as they are robbing the trees and plants of both the water and plant food that are so essential to them at this period of their growth.

There is not much to be done in the way of fighting scale insects during the month, as they are more effectually dealt with later on; but where young trees are showing signs of distress, owing to the presence of scale insects, they should be treated, the gas method being the most efficacious.

Beetles and other leaf-eating insects often make their appearance during the month. The best remedy is to spray the trees or plants with one or other of the arsenical washes that are recommended by me in this Journal. The vineyard will require considerable attention. Not only must it be kept well worked, but any vines that are subject to the attack of black spot must be sprayed from time to time with bordeaux mixture. Disbudding must be carefully carried on, as this work is equally as important as the winter pruning, as it is the best means of controlling the future shape of the vine. A very common fault with vines grown in the coast districts is that the buds often remain dormant, only the terminal bud and possibly one other starting into growth, thus leaving a long bare space on the main rods, which is undesirable. When this takes place, pinch back those shoots that have started, and

which are taking the whole of the sap, and force the sap into the dormant buds, thus starting them into growth. This will result in an even growth of wood all over the vine—not a huge cane in one part and either a stunted growth or dormant buds on the rest.

Every care should be taken during the month to prevent the fruit fly from getting an early start. All infested oranges, loquats, kumquats, or other fruits should be gathered and destroyed, as the keeping in check of the early spring crop of flies, when there are only comparatively few to deal with, will materially lessen the subsequent crops. Land that is to be planted to pines or bananas should be got ready now, though the planting need not be done till October, November, or even later. Prepare the land thoroughly; don't scratch the surface to the depth of a few inches, but plough as deeply as you have good surface soil, and break up the subsoil as deeply as you can possibly get power to do it. You will find that the extra money expended will be a profitable investment, as it will pay every time.

THE TROPICAL COAST DISTRICTS.

September is usually a very dry month, and fruit trees of all kinds suffer in consequence. The spring crop of citrus fruits should be harvested by the end of the month, as, if allowed to hang later, there is a great risk of loss by fly. The fruit should be well sweated, and, if carefully selected, well-graded, and well packed, it should carry well to, and fetch high prices in, the Southern States, as there are no oranges or mandarins grown in Australia that can excel the flavour of the best of the Bowen, Cardwell, Cairns, Port Douglas, or Cooktown fruit.

As soon as the fruit is gathered, the trees should be pruned and sprayed with the lime and sulphur wash, as this wash is not only a good insecticide, but it will keep down the growth of all lichens, mosses, &c., to which the trees are very subject.

Every care should be taken to keep down the crop of fruit-fly during the month. All infested fruit should be gathered and destroyed, particularly that in or adjacent to banana plantations. Watch the banana gardens carefully, and keep well cultivated. New land should be got ready for planting, and where land is ready planting can take place.

Papaws and granadillas are in good condition now, and, if carefully gathered and well packed in cases only holding one layer of fruit, they should carry well to the Southern markets if sent in the cool chamber.

THE SOUTHERN AND CENTRAL TABLELANDS.

Prune grape vines at Stanthorpe in the early part of the month, leaving the pruning as late as possible, as the object is to keep the vines back in order to escape damage from late spring frosts. All vines subject to the attack of black spot should be treated with the winter dressing when the buds are swelling; this treatment to be followed by spraying with Bordeaux mixture later on.

Where fruit trees have not received their winter spraying, they should be treated at once before they come out into flower or young growth. Where the orchard or vineyard has not been ploughed, do so, taking care to work the land down fine as soon as it is ploughed, so as to keep the moisture in the soil, as the spring is always the trying time for fruit trees.

Look out for fruit-fly in the late oranges and loquats in the Toowoomba district. Keep the orchards and vineyards well cultivated; disbud the vines when sufficiently advanced. Spray for codlin moth.

In the Central tablelands irrigate vines and fruit trees, and follow the irrigation with deep, constant, and systematic cultivation. Keep down all weed growth, and fight the red scale on citrus trees with cyanide. The objective of the fruitgrowers throughout Queensland during September and the following months is, "How best to keep the moisture in the soil that is required by the trees, vines, plants, and vegetables"; and this objective can only be obtained by irrigation where same is available, or by deep, systematic, and constant cultivation where there is no water available for irrigation.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·1	5·35	5·29	5·47	4·59	6 5	4·46	6·28
2	6·0	5·35	5·28	5·48	4·58	6·6	4·46	6·29
3	5 59	5·36	5·27	5·49	4·57	6 6	4·46	6·30
4	5·58	5·36	5 26	5·49	4·57	6·7	4·46	6·31
5	5 57	5·37	5·24	5·50	4·56	6 8	4·46	6·32
6	5·56	5·37	5·23	5·50	4·55	6·9	4·46	6·33
7	5·55	5·37	5·22	5·50	4·55	6 9	4·46	6·33
8	5·54	5·37	5·21	5·51	4·54	6·10	4·47	6·34
9	5·53	5·38	5·20	5·51	4 53	6·10	4·47	6 34
10	5·52	5·38	5·19	5·51	4·52	6·11	4·47	6·35
11	5·50	5·38	5·17	5·52	4·52	6·12	4·47	6·35
12	5·49	5·39	5·16	5 52	4·51	6 13	4·48	6·35
13	5·48	5·39	5·15	5·53	4·51	6·14	4·48	6·36
14	5·47	5·40	5·14	5·54	4·50	6·15	4·48	6 37
15	5 46	5·40	5·13	5·55	4·50	6·16	4·49	6 37
16	5·45	5·41	5·12	5·55	4·49	6·17	4·49	6·38
17	5·44	5·41	5·11	5·56	4·49	6·18	4·49	6·38
18	5·43	5·42	5·10	5·56	4·48	6·18	4·50	6·39
19	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·39
20	5·41	5·43	5·8	5·58	4 48	6 20	4·50	6·40
21	5·40	5·43	5·7	5·59	4·48	6·21	4·51	6·40
22	5·39	5·43	5·6	5 59	4·48	6·21	4·51	6·41
23	5·38	5·44	5·5	6·0	4·48	6 22	4·52	6·41
24	5·37	5·44	5·4	6·0	4·47	6·22	4·52	6·42
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·34	5·45	5·3	6·1	4·47	6·24	4·53	6·43
27	5·33	5·45	5·2	6·2	4·47	6·24	4·54	6·44
28	5·32	5·45	5·1	6·2	4·47	6·25	4·54	6·44
29	5·31	5·46	5·0	6 3	4·47	6·26	4·55	6·45
30	5·30	5·46	5·0	6·3	4·47	6·27	4·56	6·45
31	...	...	4·59	6·4	...	...	4·57	6.45

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria).

			H.	M.
6 Sept.	☽	Last Quarter	5	5 a.m.
12 „	●	New Moon	10	52 p.m.
20 „	☾	First Quarter	2	55 p.m.
28 „	○	Full Moon	11	57 a.m.

Perigee on 9th at 8·12 a.m. Apogee on 21st at 8·42 a.m.

5 Oct.	☽	Last Quarter	10	54 a.m.
12 „	●	New Moon	10	50 a.m.
20 „	☾	First Quarter	10	30 a.m.
28 „	○	Full Moon	12	9 a.m.

Perigee on 4th at 7·54 p.m. and 31st at 12·26 a.m. Apogee on 19th at 4·42 a.m. A Total Eclipse of the Moon will occur on the night of the 27th, commencing about 11 30. An hour earlier it will be entering the dark shadow of the earth.

3 Nov.	☽	Last Quarter	5	35 p.m.
11 „	●	New Moon	2	5 a.m.
19 „	☾	First Quarter	6	13 a.m.
26 „	○	Full Moon	11	42 a.m.

Apog e on 16th at 12·18 a m. Perigee on 27th at midnight. The Moon will cause a partial eclipse of the Sun during the night of the 10th, visible only on the other side of the world, including Great Britain and Ireland.

3 Dec.	☽	Last Quarter	2	29 a.m.
10 „	●	New Moon	8	4 p.m.
19 „	☾	First Quarter	12	40 a.m.
25 „	○	Full Moon	10	39 p.m.

Apogee on 13th at 3·30 p m. Perigee on 26th at 10·24 a.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

At Roma the times of sunrise and sunset may be roughly arrived at by adding 16 minutes to those given for Brisbane, but an allowance of 3 or 4 minutes more is sometimes necessary.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JUNE, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1920.	June, 1919.
North Coast.	In.		In.	In.
Atherton	1·59	19	0·32	1·28
Cairns	2·75	38	1·75	2·21
Cardwell	2·03	48	3·13	1·30
Cooktown	2·02	44	1·19	1·47
Herberton	0·96	33	0·94	0·81
Ingham	2 31	28	3·94	0·28
Innisfail	6·59	39	4·22	8·23
Mossman	2·14	12	...	1·86
Townsville	1·29	49	1·02	0·34
Central Coast.				
Ayr	1·31	33	1 91	0·79
Bowen	1·63	49	1·24	2·69
Charters Towers ...	1·37	38	0 75	0·20
Mackay	2·70	49	3 07	1·61
Proserpine	3·65	17	3·19	2·84
St. Lawrence ...	2·45	19	2·88	0·83
South Coast.				
Biggenden	1·74	21	2·27	0 04
Bundaberg	2·67	37	2·67	0·13
Brisbane	2·57	69	3·24	0·78
Childers	2·10	25	2·97	0 07
Crohamhurst ...	4·13	25	3·83	2·40
Esk	1·92	33	2·35	0·86
Gayndah	1·77	49	1·96	0·08
Gympie	2·43	50	3·12	0·81
Glasshouse M'tains	3·46	12	4·73	1·16
Kilkivan	1·90	41	2·19	0·56
Maryborough ...	2·78	49	3·44	0·67

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1920.	June, 1919.
South Coast—continued:	In.		In.	In.
Nambour	3·18	24	3·94	1·41
Nanango	1·88	38	3·12	0·70
Rockhampton ...	1·96	33	0·59	0·87
Woodford	2·50	33	2·51	1·00
Darling Downs.				
Dalby	1·59	50	2·12	0·07
Emu Vale	1·29	24	1·61	0·02
Jimbour	1·54	32	1·80	0·10
Miles	1·85	35	1·93	Nil
Stanthorpe ...	1·74	47	4·61	0·30
Toowoomba ...	2·27	48	2·72	0·79
Warwick	1·56	33	2·28	0·19
Maranoa.				
Roma	1·63	46	2 26	0·70
State Farms, &c.				
Bungeworgorai ...	1·08	6	3·19	0·49
Gatton College ...	1·52	21	2·18	0·40
Gindie	1·44	21	1·40	0·09
Hermitage ...	1·72	14	2·15	0·11
Kairi	0·80	6	0·72	1·27
Sugar Experiment Station, Mackay	2·20	23	3·40	1·56
Warren	1·13	6	1·23	0·15

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for June this year, and for the same period of 1919, having been compiled from telegraphic reports are subject to revision.

GEORGE G. BOND, State Meteorologist.